PLANT ASSOCIATION AND MANAGEMENT GUIDE

WILLAMETTE NATIONAL FOREST

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CONTENTS

Page

INTRODUCTION 1
KEY TO PLANT ASSOCIATIONS 13

EXPLANATION OF ASSOCIATION DESCRIPTIONS. 32

ASSOCIATION DESCRIPTIONS 33

Douglas-fir series
Douglas-fir/oceanspray-dwarf Oregon grape 34
Douglas-fir/oceanspray/grass 36
Douglas-fir/oceanspray-whipple vine 38
Douglas-fir/snowberry 40
Douglas-fir - western hemlock/dwarf Oregon grape. . . 42
Douglas-fir - western hemlock/rhododendron. 44
Douglas-fir - western hemlock/salal 46

Grand fir series
Grand fir/bearberry 48
Grand fir/dwarf Oregon grape. 50
Grand fir/prince's pine 52

Pacific silver fir series
Pacific silver fir-grand fir/false solomonseal. . . . 54
Pacific silver fir/Alaska huckleberry/
dogwood bunchberry 56
Pacific silver fir/Alaska huckleberry-salal 58
Pacific silver fir/big huckleberry/beargrass. 60
Pacific silver fir/big huckleberry/
queencup beadlily. 62
Pacific silver fir/Cascades azalea/beargrass. 64
Pacific silver fir/Cascades azalea/
queencup beadlily. 66
Pacific silver fir/coolwort foamflower. 68
Pacific silver fir/devil's club 70
Pacific silver fir/dwarf Oregon grape 72
Pacific silver fir/fool's huckleberry 74
Pacific silver fir/Oregon oxalis. 76
Pacific silver fir/rhododendron-Alaska huckleberry/
dogwood bunchberry 78
Pacific silver fir/rhododendron/beargrass 80
Pacific silver fir/rhododendron-
dwarf Oregon grape 82
Pacific silver fir/vine maple/coolwort foamflower . . 84
Pacific silver fir-western hemlock/rhododendron-
salal. 86

CONTENTS (cont.)

Page

Mountain hemlock series

Mountain hemlock/big huckleberry/beargrass. 88
Mountain hemlock/grouse huckleberry 90
Mountain hemlock/luzula 92
Mountain hemlock/rhododendron 94

Western hemlock series

Western hemlock/Alaska huckleberry/
dogwood bunchberry 96
Western hemlock/devil's club. 98
Western hemlock/dwarf Oregon grape. 100
Western hemlock/dwarf Oregon grape/Oregon oxalis . 102

Western hemlock/dwarf Oregon grape-salal. 104
Western hemlock/dwarf Oregon grape/vanilla leaf . . 106
Western hemlock/Oregon oxalis 108
Western hemlock/rhododendron-Alaska huckleberry/
dogwood bunchberry 110
Western hemlock/rhododendron/beargrass. 112
Western hemlock/rhododendron-dwarf Oregon grape . . 114
Western hemlock/rhododendron/Oregon oxalis. 116
Western hemlock/rhododendron-salal. 118
Western hemlock/rhododendron/twinflower 120
Western hemlock/salal 122
Western hemlock/swordfern 124
Western hemlock/twinflower. 126
Western hemlock/vanilla leaf. 128

Non-forested communities

Beargrass-red fescue. 130
Blueberry-alpine spirea/grass 132
Blue wildrye-brome. 134
Common vetch-peregrine fleabane-wild bluerye
(xeric). 136
Douglas spirea-bog blueberry/sedge (hydric) 138
False hellebore-common cowparsnip 140
Rock garden (flat, xeric) 142
Rock garden (steep, moist). 144
Rock garden (steep, xeric). 146
Sedge-panicled bulrush (hydric) 148
Sedge-twinflower marshmerigold. 150
Shrub (lava). 152
Sitka alder (rocky soil). 154

CONTENTS (cont.)

Page

Spirea-willow/sedge 156
Talus 158
Thimbleberry-pokeweed fleeceflower. 160
Vine maple (rocky soil) 162
Vine maple (talus). 164
Woolly eriophyllum-varileaf phacelia (xeric). . . . 166

REFERENCES CITED 169

APPENDIX I Vegetative tables for the Douglas-fir, grand fir, and western hemlock series. 171

APPENDIX II Vegetative tables for the Pacific silver fir and mountain hemlock series. 201

APPENDIX III Growth basal area by plant association. . . 221

The line drawings in this publication are from Hitchcock et al., (1955, 1959, 1961, 1964 and 1969) Vascular Plants of the Pacific Northwest and are used by permission.

INTRODUCTION

This field guide contains a condensation of the information presented in the desk version of the Plant Association and Management Guide for the Willamette National Forest (Hemstrom et al. 1987). It contains enough information to allow field identification of plant associations and summaries of basic environmental, vegetative and management characteristics. Productivity information and wildlife attributes by plant association are summarized in Tables 1 through 5. Please refer to the desk guide for a more in-depth discussion of general environmental and vegetative conditions, succession, wildlife habitat, tree growth, and early seral development.

The key is designed for use in stands at least 50 years old. Lands outside the Willamette National Forest may fall within the range of conditions included in this guide, but discretion is advised.

CLASSIFICATION CONCEPTS

A scheme based upon potential natural vegetation was used for classification of plant associations. The use of potential natural vegetation (i.e., climax) to describe plant associations does not mean that stands must be in climax status to be classified or even that we will ever see climax conditions. Instead, the concept relates to the environmental conditions that determine where a species could be climax and where it could not.
The plant community as a whole is used to distinguish the series and association for the site, and therefore its environmental and biological characteristics. Some species--swordfern and vine maple, for example--occur so widely that they are not used to name associations except where they indicate an important difference or where no other species dominate the understory.

This guide is based on classification of approximately 1500 reconnaissance and 300 intensive plots sampled throughout the Forest. Five major forested series are found on the Willamette National Forest: the Douglas-fir (7 plant associations), western hemlock (17 plant associations), grand fir (3 plant associations), Pacific silver fir (17 plant associations) and mountain hemlock (4 plant associations). In addition, 19 non-forest plant communities have been described.

Table 1. Comparative autecological characteristics of important conifer species (Minore 1979).

Species	Shade Tolerance	Frost Tol.	Drought Tol.	Snow Damage Resistance	Fire Res.	Root Rot Res.	Seed Crop Freq.
Pacific silver fir	H[1]	M	L	M	L*	L	M
Subalpine fir	H	M	M	H	L	M	M
Grand fir	H	M	M	M	M	L	M
Noble fir	L	M*	L*	M	M	M*	M*
Incense cedar	L	M	H	M*	H*	M	**
Alaska cedar	M	M*	L*	H*	L*	H*	**
Engelmann spruce	L	H	M	H*	L	M	M
White bark pine	L*	H*	**	H*	M*	**	**
Lodgepole pine	L	H	H	M*	L	M	M
Sugar pine	M	M	M	L	M	**	**
Western white pine	M	H	M	M	M	M	H
Douglas-fir	L	L	M	L	H	L	M
Western redcedar	H	L	M	M*	L	H	M
Western hemlock	H	L	L	H	L	M	M
Mountain hemlock	H	H	L	H	M	L	M

[1] H - high, M - moderate, L - low.

* Not listed in Minore (1979), estimated from field observations and species similarities.

** No estimates available.

Table 2. Stand statistics and Douglas-fir site index for Douglas-fir, grand fir, and western hemlock series plant associations, Willamette National Forest. Dashes indicate missing or insufficient data.

	Number of Intensive Plots	Douglas-fir SI50[1]		Douglas-fir SI100[2]	
		Mean	SE	Mean	SE
Douglas-fir Series					
Douglas-fir/oceanspray-dwarf Oregon grape	5	96	7	115	3
Douglas-fir/oceanspray/grass	13	87	4	121	1
Douglas-fir/oceanspray-whipple vine	5	87	5	106	4
Douglas-fir/snowberry	5	104	6	123	6
Douglas-fir-western hemlock/dwarf Oregon grape	7	101	4	145	2
Douglas-fir-western hemlock/salal	12	108	8	138	1
Douglas-fir-western hemlock/rhododendron	5	105	4	133	1
Grand fir Series					
Grand fir/bearberry	3	64	-	86	1
Grand fir/dwarf Oregon grape	11	86	-	131	1
Grand fir/prince's pine	9	108	1	132	1
Grand fir-Pacific silver fir/false solomonseal	3	117	-	133	2

[1]King (1966) for site trees less than 120 years old. Only data from intensive plots used.

[2]McArdle et al. (1961) for trees in the Douglas-fir and grand fir series.

Table 2. (continued)

	Number of Intensive Plots	Douglas-fir SI50[1]		Douglas-fir SI100[2]		
		Mean	SE	Mean	SE	n
Western hemlock/Alaska huckleberry/dogwood bunchberry	7	94	-	137	1	32
Western hemlock/ dwarf Oregon grape	19	105	5	139	1	54
Western hemlock/dwarf Oregon grape/ Oregon oxalis	12	117	9	159	1	57
Western hemlock/dwarf Oregon grape-salal	12	101	5	133	1	36
Western hemlock/dwarf Oregon grape/vanilla leaf	12	117	7	158	1	55
Western hemlock/devil's club	7	111	12	168	1	20
Western hemlock/Oregon oxalis	17	114	7	158	1	62
Western hemlock/rhododendron-Alaska huckleberry/dogwood bunchberry	6	116	-	131	1	26
Western hemlock/rhododendron/ beargrass	8	84	7	122	1	26
Western hemlock/rhododendron-dwarf Oregon grape	20	99	12	136	1	80
Western hemlock/rhododendron/ Oregon oxalis	6	116	-	135	1	26
Western hemlock/rhododendron-salal	11	99	5	128	1	48
Western hemlock/rhododendron/ twinflower	6	105	18	130	1	19
Western hemlock/salal	14	107	4	137	1	42

Table 2. (continued)

	Number of Intensive Plots	Douglas-fir SI50[1]		Douglas-fir SI100[2]		
		Mean	SE	Mean	SE	n
Western hemlock/swordfern	12	120	5	159	1	36
Western hemlock/twinflower	7	110	4	148	1	16
Western hemlock/vanilla leaf	8	121	5	151	1	25

1 King (1966) for site trees less than 120 years old. Only data from intensive plots used.

2 McArdle et al. (1961) for trees in the Douglas-fir and grand fir series.

Table 3. Productivity summary for Pacific silver fir and mountain hemlock plant associations, Willamette National Forest.

Plant Association	No. of Plots	Douglas-fir[1] Site Index	Noble fir[2] Site Index	GBA[3] Douglas-fir
		Mean/ n	Mean/ n	Mean
Pacific silver fir/[4] Alaska huckleberry/ dogwood bunchberry	9	102/ 6	110/ 1	384
Pacific silver fir/[4] Alaska huckleberry -salal	2	72/ 2	-	420
Pacific silver fir/big huckleberry/ beargrass	12	96/ 6	94/ 6	301
Pacific silver fir/big huckleberry/queencup beadlily	9	112/ 6	126/ 2	254
Pacific silver fir/[5] Cascades azalea/beargrass	12	73/ 3	-	282
Pacific silver fir/[5] Cascades azalea/queencup beadlily	12	73/ 3	-	282
Pacific silver fir/coolwort foamflower	18	119/12	128/14	398
Pacific silver fir/[6] Devil's club	10	123/ 8	135/ 5	375
Pacific silver fir/[7] dwarf Oregon grape	6	104/ 6	76/ 2	296
Pacific silver fir/[5] fool's huckleberry	12	73/ 3	-	282
Pacific silver fir/[6] Oregon oxalis	10	123/ 8	135/ 5	375

Table 3.

Plant Association	No. of Plots	Douglas-fir[1] Site Index	Noble fir[2] Site Index	GBA[3] Douglas-fir
		Mean/n	Mean/n	Mean
Pacific silver fir/rhododendron-Alaska huckleberry/dogwood bunchberry[4]	17	97/ 7	95/ 2	347
Pacific silver fir/rhododendron/ beargrass	12	96/11	96/ 6	341
Pacific silver fir/rhododendron-dwarf Oregon grape[7]	6	104/ 6	76/ 2	296
Pacific silver fir/vine maple/coolwort foamflower	6	133/ 6	140/ 4	452
Pacific silver fir-western hemlock/rhododendron-salal[4]	5	101/ 5	-	276
Mountain hemlock/big huckleberry/beargrass	15	95/ 3	71/ 4	312
Mountain hemlock/grouse huckleberry	8	70/ 1	70/ 1	184
Mountain hemlock/rhododendron[4]	21	91/15	-	-

[1] 100 year base, Curtis et al. (1974).

[2] 100 year base, Herman et al. (1978).

[3] Growth basal area (Hall 1971).

[4] Information is based on reconnaissance plot data.

[5] Pacific silver fir/Cascades azalea/beargrass, Pacific silver fir/Cascades azalea/queencup beadlily and Pacific silver fir/fool's huckleberry associations combined.

[6] Pacific silver fir/Oregon oxalis and Pacific silver fir/devil's club associations combined.

[7] Pacific silver fir/dwarf Oregon grape and Pacific silver fir/rhododendron/dwarf Oregon grape associations combined.

Table 4. Number of snags over 20 inches DBH per acre by decay class and plant association from intensive ecology plots on the Willamette National Forest.

Association	Number of Samples	Snags Over 20 Inches DBH Per Acre By Decay Class 1	2	3	4	5	Total
		Mean					
Douglas-fir/oceanspray-dwarf Oregon grape	5	0.5	0.0	1.9	0.8	0.0	3.2
Douglas-fir/oceanspray/grass	13	1.1	0.7	1.1	1.2	0.2	4.3
Douglas-fir/oceanspray-whipple vine	5	0.4	1.7	0.2	1.3	0.9	4.6
Douglas-fir/snowberry	5	0.2	0.0	1.1	0.0	0.0	1.2
Douglas-fir-western hemlock/ dwarf Oregon grape	7	0.0	0.0	1.4	0.8	0.0	2.1
Douglas-fir-western hemlock/ salal	12	0.5	1.2	2.4	2.9	0.6	7.5
Douglas-fir-western hemlock/ rhododendron	5	0.3	0.6	1.1	0.9	0.3	3.2
Grand fir/bearberry	3	0.0	0.3	0.3	0.0	0.3	1.0
Grand fir/dwarf Oregon grape	11	0.8	0.9	4.1	1.0	0.0	6.7
Grand fir/prince's pine	9	1.5	1.2	2.2	1.2	0.4	6.4
Pacific silver fir - Grand fir/false solomonseal	3	0.7	0.9	5.6	1.1	0.0	8.2
Western hemlock/Alaska huckle-berry/dogwood bunchberry	7	1.7	4.3	2.7	8.5	1.3	18.6
Western hemlock/devil's club	7	0.5	4.0	5.0	2.7	0.1	12.3
Western hemlock/ dwarf Oregon grape	19	0.2	1.1	2.1	1.6	1.1	6.1
Western hemlock/dwarf Oregon grape/ Oregon oxalis	12	1.2	1.9	8.1	3.0	0.1	14.2

Table 4. (continued)

Association	Number of Samples	Snags Over 20 Inches DBH Per Acre By Decay Class 1	2	3	4	5	Total
		----------Mean----------					
Western hemlock/dwarf Oregon grape-salal	12	0.7	1.6	1.6	3.9	0.8	8.5
Western hemlock/dwarf Oregon grape/vanilla leaf	11	0.2	1.7	4.4	2.4	1.0	9.7
Western hemlock/Oregon oxalis	17	0.5	1.2	3.0	3.2	1.1	8.9
Western hemlock/rhododendron-Alaska huckleberry/dogwood bunchberry	6	1.1	2.4	2.0	0.8	0.0	6.2
Western hemlock/rhododendron/beargrass	8	0.2	0.8	2.5	0.2	0.0	3.6
Western hemlock/rhododendron-dwarf Oregon grape	20	0.5	2.4	3.9	3.7	0.7	11.3
Western hemlock/rhododendron/Oregon oxalis	6	0.0	2.9	7.7	4.2	1.3	16.1
Western hemlock/rhododendron-salal	11	0.8	0.4	2.0	2.7	0.5	6.4
Western hemlock/rhododendron/twinflower	6	0.9	0.0	1.5	0.0	0.0	2.3
Western hemlock/salal	14	0.1	0.2	1.2	4.0	1.0	6.5
Western hemlock/swordfern	12	0.0	0.7	3.2	8.0	0.4	12.4
Western hemlock/twinflower	7	0.0	0.8	0.9	0.7	0.6	3.1
Western hemlock/vanilla leaf	8	0.0	2.8	3.9	2.9	0.0	9.6
All Associations Combined	256	0.5	1.3	2.9	2.6	0.5	7.9

Table 5. Tons of down wood per acre by decay class and plant association from intensive ecology plots on the Willamette National Forest.

Association	No. of Plots	Tons of Down Wood per Acre by Decay Class					
		1	2	3	4	5	Total
		Mean					
Douglas-fir/oceanspray-dwarf Oregon grape	5	0.1	0.8	6.8	1.9	1.1	10.7
Douglas-fir/oceanspray/grass	13	0.2	4.0	4.5	5.0	0.6	14.3
Douglas-fir/oceanspray-whipple vine	5	0.3	0.8	2.1	1.4	0.3	4.8
Douglas-fir/snowberry	5	0.5	0.1	3.1	5.5	0.9	10.1
Douglas-fir-western hemlock/ dwarf Oregon grape	7	0.2	2.9	2.0	3.0	0.7	8.7
Douglas-fir-western hemlock/ salal	12	0.7	3.9	3.5	5.0	1.4	14.5
Douglas-fir-western hemlock/ rhododendron	5	1.1	1.6	6.3	5.0	1.1	15.1
Grand fir/bearberry	3	0.1	0.6	3.4	1.4	0.3	5.5
Grand fir/dwarf Oregon grape	11	2.3	6.7	9.4	7.9	1.4	27.9
Grand fir/prince's pine	9	11.8	1.3	9.9	6.8	1.5	31.3
Pacific silver fir - grand fir/false soloman's seal	3	0.0	0.7	4.1	3.9	0.5	9.0
Western hemlock/Alaska huckle-berry/dogwood bunchberry	7	0.1	11.3	20.6	13.5	3.8	49.2
Western hemlock/devil's club	7	0.4	50.7	36.9	14.5	2.0	104.4
Western hemlock/ dwarf Oregon grape	19	0.4	6.8	9.3	6.0	2.4	24.8

Table 5. (continued)

Association	No. of Plots	Tons of Down Wood per Acre by Decay Class					
		1	2	3	4	5	Total
		Mean					
Western hemlock/dwarf Oregon grape/ Oregon oxalis	12	1.9	18.6	14.4	9.4	2.5	46.7
Western hemlock/dwarf Oregon grape-salal	12	1.5	7.2	11.7	4.7	4.9	39.9
Western hemlock/dwarf Oregon grape/vanilla leaf	12	0.1	2.6	17.4	6.3	2.0	28.4
Western hemlock/Oregon oxalis	17	0.8	9.5	16.4	15.4	2.2	44.3
Western hemlock/rhododendron-Alaska huckleberry/dogwood bunchberry	6	0.1	2.7	17.8	7.5	2.5	30.5
Western hemlock/rhododendron/ beargrass	8	0.1	4.4	11.0	9.9	1.7	27.0
Western hemlock/rhododendron-dwarf Oregon grape	20	0.5	7.7	11.2	9.6	4.0	33.0
Western hemlock/rhododendron/ Oregon oxalis	6	0.0	6.1	15.5	9.3	0.6	31.5
Western hemlock/rhododendron-salal	11	0.1	3.7	15.5	12.2	1.3	32.9
Western hemlock/rhododendron/ twinflower	6	2.0	13.2	8.4	6.4	2.1	32.1
Western hemlock/salal	14	0.7	2.6	5.6	8.8	1.4	19.1
Western hemlock/swordfern	12	0.3	6.0	19.7	23.6	4.0	53.7
Western hemlock/twinflower	7	0.1	2.1	9.5	10.0	4.0	25.5
Western hemlock/vanilla leaf	8	0.3	3.5	11.8	4.2	2.5	22.4
All Associations Combined	256	0.8	6.7	12.3	9.1	2.1	31.0

KEY TO PLANT ASSOCIATIONS

1. Select a vegetatively and topographically uniform area.

2. Identify and list tree, shrub, and herb species and estimate the cover of each. Cover is estimated to the nearest percent up to 10 percent cover and to the nearest 5 percent thereafter.

3. Work through the series and association keys (step by step) to a preliminary identification.

4. Review the association description to verify the identification.

It is important to follow these steps rigorously since a misidentification may lead to the wrong management implications.

The associations are abstractions based upon plot data taken throughout the Forest. In each case, plots were grouped according to plant community similarity and used as the basis for an abstraction process. Few stands will exactly conform to descriptions of average stands in the association descriptions.

Variation in vegetation across the landscape is continuous. Although we sampled in a systematic manner, there are many ecotonal areas which will not fit neatly into any particular association. Such areas should be managed according to the characteristics of the associations between which they fall. In most cases, floristically similar associations have similar management properties.

This key and guide should be used in the field to aid proper identification of associations. Questions concerning identification should be addressed in the field where species composition and cover are easily and correctly measured.

Series Key

1. Tree cover less than 10%, no indications that the area will be forested in the next 100 years. Non-forest communities, page 22.

2. Oregon white oak the major tree species, canopy open, understory grassy. Oregon white oak woodland, not present in sufficient amounts to describe.

3. Lodgepole pine the only regenerating species and makes up more than 75% of the canopy. Lodgepole pine-volcanic ash. Not described in this guide.

4. Mountain hemlock cover over 20% in canopy or over 2% in regeneration layer. Mountain hemlock series key, page 18.

5 Pacific silver fir cover over 20% in canopy or over 2% in regeneration layer. Pacific silver fir series key, page 18.

6. Grand fir regeneration at least as abundant as Douglas-fir or western hemlock, dry-site indicating species present. Grand fir series key, page 17.

7. Douglas-fir and incense cedar regeneration more abundant than western hemlock regeneration. Western hemlock absent or minor in both regeneration and canopy layers. Douglas-fir series key, page 16.

8. Western hemlock the most abundant regenerating species. Western hemlock series key, page 20.

9. Regeneration absent and canopy essentially pure Douglas-fir. Oceanspray cover over 10%, or any 2 of tall Oregon grape, poison oak, oceanspray, or whipple vine over 2% cover each. Douglas-fir series key, page 16.

10. Regeneration absent and canopy essentially pure Douglas-fir. Dry-site indicating species not common. Western hemlock series key, page 20.

Douglas-fir Series Key

1. At least two of the follwing present with at least 2% cover each: tall Oregon grape, poison oak, mock orange, hairy honeysuckle, whipple vine or oceanspray cover over 15 percent.....(2)
1. A combination of species indicating very dry sites lacking ...(5)

2. Dwarf Oregon grape over 10% cover...PSME/HODI-BENE CDS2 11 p. 34
2. Dwarf Oregon grape minor.....(3)

3. Whipple vine cover over 10%.....PSME/HODI-WHMO CDS2 13 p. 38
3. Whipple vine minor.....(4)

4. Grass cover over 5%.....PSME/HODI/GRASS CDS2 12 p. 36
4. Grass minor, understory sparse. Return to step 2 and use relative cover.

5. Rhododendron cover over 15%.....PSME-TSHE/RHMA CDC7 12 p. 44
5. Rhododendron minor.....(6)

6. Snowberry cover over 20%.....PSME/SYMO - WILL CDS6 41 p. 40
6. Snowberry minor.....(7)

7. Dwarf Oregon grape over 10% cover and greater than salal cover.....PSME-TSHE/BENE CDC7 11 p. 42
7. Dwarf Oregon grape minor or salal more abundant.....(8)

8. Salal cover over 20%.....PSME-TSHE/GASH CDC7 13 p. 46
8. Salal minor, understory sparse. Shaded, return to step 1 and use relative cover.

Grand Fir Series Key

1. False solomonseal over 15%. Coolwort foamflower, wild ginger and other moist-site indicating herbs usually common. Elevation generally over 3500 feet.....ABAM-ABGR/SMST CFC3 11 P. 54
1. Moist-site indicating herbs minor.. .....(2)

2. Prince's pine cover over 20%.....ABGR/CHUM CWF2 11 p. 52
2. Prince's pine minor.....(3)

3. Bearberry or pinemat manzanita cover over 20 percent..... .....ABGR/ARUV CWS5 21 p. 48
3. Bearberry and pinemat manzanita minor.....(4)

4. Dwarf Oregon grape over 10%.....(5)
4. Sparse understory, return to step 1 and use relative cover.

5. Any three of the following with over 2% cover each: Baldhip rose, snowberry, oceanspray, California hazel, incense cedar, whipple vine.....ABGR/BENE CWS5 22 p. 50
5. Dry-site indicating species missing. Go to western hemlock series key.....p. 20

Mountain Hemlock Series Key

1. Grouse huckleberry cover over 5%.....TSME/VASC CMS1 14 p. 90
1. Grouse huckleberry minor.....(2)

2. Rhododendron cover over 10%.....TSME/RHMA CMS6 12 p. 94
2. Rhododendron minor.....(3)

3. Beargrass over 5% cover.....TSME/VAME/XETE CMS2 16 p. 88
3. Beargrass minor.....(4)

4. Luzula over 5% cover.....TSME/LUZUL CMG2 11 p. 92
4. Luzula minor or absent.....(5)

5. Stand interlaced with subalpine meadows or non-forest areas. .....Subalpine parkland, not covered in this guide.
5. Understory nearly absent. Return to step 1 and use relative cover.

Pacific silver fir Series Key

1. Devil's club cover over 5%.....ABAM/OPHO CFS3 51 p. 70
1. Devil's club minor.....(2)

2. Cascades azalea cover over 5%.....(3)
2. Cascades azalea minor.....(4)

3. Herb poor, giant fawnlily or beargrass the only significant herbs .....ABAM/RHAL/XETE CFS5 51 p. 64
3. Several herbs present, especially dogwood bunchberry, vanilla leaf, rosy twisted stalk, coolwort foamflower, and queencup beadlily. Beargrass can be abundant..... .....ABAM/RHAL/CLUN CFS5 52 p. 66

4. Fool's huckleberry cover over 5% or greater than Alaska, oval-leaf, or big huckleberries.....ABAM/MEFE CFS2 54 p. 74
4. Fool's huckleberry minor or absent.....(5)

5. Oregon oxalis cover over 5%.....ABAM/OXOR CFF1 53 p. 76
5. Oregon oxalis minor or absent.....(6)

6. Salal cover over 5%.....(7)
6. Salal minor or absent.....(8)

7. Alaska or oval-leaf huckleberry cover over 10%
.....ABAM/VAAL-GASH CFS2 55 p. 58
7. Alaska and oval-leaf huckleberry minor, rhododendron usually abundant.....ABAM-TSHE/RHMA-GASH CFC2 51 p. 86

8. False solomonseal cover over 15% (usually over 20%), grand fir (white fir) usually common in canopy and regeneration layers...
.....ABAM-ABGR/SMST CFC3 11 p. 54
8. Coolwort foamflower cover at least equal to false solomonseal cover or false solomonseal minor, grand fir may be present.....(9)

9. Coolwort foamflower or false solomonseal cover over 5% or three or more of the following herbs with over 2% cover each: coolwort foamflower, false solomonseal, rosy twisted stalk, wild ginger, inside-out-flower, and vanilla leaf .....(10)
9. Moist site indicating herbs minor .....(11)

10. Vine maple cover over 15%.....ABAM/ACCI/TITR CFS6 51 p. 84
10. Vine maple minor or absent.....ABAM/TITR CFF1 52 p. 68

11. Alaska or oval-leaf huckleberry cover over 10%.....(12)
11. Alaska and oval-leaf huckleberry minor.....(13)

12. Rhododendron cover over 30%....ABAM/RHMA-VAAL/COCA CFS6 54 p. 78
12. Rhododendron cover less than 30%....ABAM/VAAL/COCA CFS2 53 p. 56

13. Rhododendron cover greater than 30% or, in shrub poor areas, rhododendron the only significant tall shrub.....(14)
13. Rhododendron cover less than 30%.....(15)
14. Beargrass cover over 10% or beargrass the only herb present
.....ABAM/RHMA/XETE CFS6 53 p. 80
14. Beargrass minor or absent. Dwarf Oregon grape usually important.
.....ABAM/RHMA-BENE CFS6 52 p. 82

15. Dwarf Oregon grape cover over 5%. Big huckleberry cover usually less than 10 percent.....ABAM/BENE CFS1 51 p. 72
15. Dwarf Oregon grape minor or absent. Big huckleberry usually the major shrub.....(16)

16. Several herbs in addition to beargrass present, usually including queencup beadlily, false solomonseal, and vanilla leaf.....
.....ABAM/VAME/CLUN CFS2 56 p. 62
16. Beargrass the major herb, other herbs minor.....(17)

17. Beargrass over 5% cover, other herbs minor..ABAM/VAME/XETE CFS2 51 p. 60
17. Understory nearly absent. Shaded, return to step 1 and use relative cover.

Western Hemlock Series Key

1. Devil's club cover over 10%.....TSHE/OPHO-WILL CHS5 11 p. 98
1. Devil's club minor.....(2)

2. Rhododendron cover over 20%.....(3)
2. Rhododendron minor.....(8)

3. Oregon oxalis cover over 15%.....TSHE/RHMA/OXOR CHS3 54 p. 116
3. Oregon oxalis minor.....(4)

4. Beargrass cover over 10%.....TSHE/RHMA/XETE-WILL CHS3 53 p. 112
4. Beargrass minor.....(5)

5. Dwarf Oregon grape cover over 15% and greater than salal cover. ..... TSHE/RHMA-BENE-WILL CHS3 52 p. 114
5. Dwarf Oregon grape minor or less than salal cover.....(6)

6. Salal cover over 20%.....TSHE/RHMA-GASH-WILL CHS3 51 p. 118
6. Salal minor.....(7)

7. Twinflower cover over 15%.....TSHE/RHMA/LIBO2 CHS3 55 p. 120
7. Shaded, return to step 3 and use relative covers.

8. Alaska huckleberry and/or oval-leaf huckleberry cover over 5%..(9)
8. Alaska huckleberry and oval-leaf huckleberry minor.....(10)

9. Rhododendron cover over 10%...TSHE/RHMA-VAAL/COCA CHS3 26 p. 110
9. Rhododendron minor.....TSHE/VAAL/COCA CHS6 15 p. 96

10. Dwarf Oregon grape cover about equal to salal cover and each over 15% cover.....TSHE/BENE-GASH-WILL CHS1 24 p. 104
10. Dwarf Oregon grape or salal minor or covers not equal.....(11)

11. Dwarf Oregon grape cover over 20%.....(12)
11. Dwarf Oregon grape minor.....(14)

12. Oregon oxalis cover over 15%.....TSHE/BENE/OXOR CHS1 13 p. 102
12. Oregon oxalis minor.....(13)

13. Vanilla leaf cover over 10% or 2 of vanilla leaf, coolwort foamflower, or, false solomonseal over 2% cover each..... .....TSHE/BENE/ACTR CHS1 14 p. 106
13. Herbs other than swordfern minor.....TSHE/BENE CHS1 25 p. 100

14. Salal cover over 20%.....TSHE/GASH-WILL CHS1 11 p. 122
14. Salal minor.....(15)

15. Oregon oxalis cover over 25%.....TSHE/OXOR-WILL CHF1 11 p. 108
15. Oregon oxalis minor.....(16)

16. Vanilla leaf cover greater than 10% or 2 of vanilla leaf, coolwort foamflower, or false solomonseal with 5% cover each.....
.....TSHE/ACTR CHF2 21 p. 128
16. Vanilla leaf, coolwort foamflower and false solomonseal minor.(17)

17. Twinflower cover over 20%.....TSHE/LIBO2 CHF3 21 p. 126
17. Twinflower minor.....(18)

18. Swordfern cover over 20%.....TSHE/POMU-WILL CHF1 51 p. 124
18. Swordfern minor, shaded. Return to step 1 and use relative covers.

Key to Non-Forest Communities

This key is based on analysis of 120 plots in non-forest communities across the Forest. Alpine parklands and tundra were not sampled. Do not use this key in areas above upper treeline. We could not sample all non-forest communities that exist on the Forest. As a consequence, this key will not always work. Open areas tend to be individual, each different from all the rest in the details of species composition and abundance. This key and the non-forest classification are designed around similarity of environment and the dominance of different vegetative life forms. We hope to gather additional samples, particularly in Wilderness Areas, and refine the classification and key in the near future.

1. Tree cover over 10 percent. Forested, go to page 15.
1. Tree cover less than 10 percent. No indications that the site will be forested in 100 years .....(2)

2. Vegetative cover less than 5 percent. Unvegetated, not sampled and not included in this guide.
2. Vegetative cover over 5 percent.....(3)

3. Surface rock over 70 percent cover.....(4)
3. Surface rock less than 70 percent cover.....(9)

4. Moss covered bedrock.....(5)
4. Talus or lava, often with moss cover.....(7)

5. Dry by early summer, herb cover less than 35 percent.....(6)
5. Moist through mid-summer, herb cover over 35 percent.....
.....Rock Garden (steep, moist) NRL9 12 p. 144

6. Slope over 80 percent..Rock Garden (steep, xeric) NRL9 11 p. 146
6. Slope less than 80 percent.....
.....Rock Garden (flat, xeric) NRR9 11 p. 142

7. Recent lava flows, shrub cover over 10 percent.....
.....Shrub (lava) NCS1 11 p. 152
7. Talus, occasionally covered with moss or thin soil.....(8)

8. Shrub cover, especially vine maple, over 25 percent.....
.....Vine Maple (talus) NTS2 11 p. 164
8. Shrubs cover less than 25 percent.....Talus NTS9 11 p. 158

9. Soils less than 8 inches deep to bedrock, forbs dominate the vegetation, total vegetative cover usually less than 15 percent
.....Woolly Eriophyllum-Varileaf Phacelia (xeric) FM99 11 p. 166
9. Soils deeper, vegetative cover usually over 15 percent..... (10)

10. Vine maple cover over 35 percent.....
.....Vine Maple (rocky soil) SM81 12 p. 162
10. Vine maple minor or absent..... (11)

11. Sitka alder cover over 35 percent.....
.....Sitka Alder (rocky soil) SM81 11 p. 154
11. Sitka alder minor or absent..... (12)

12. Soils dry through most of the growing season ..... (18)
12. Soils moist or saturated most of the growing season..... (13)

13. Shrub cover over 10 percent.....(16)
13. Shrubs usually minor or absent.....(14)

14. False hellebore or cowparsnip cover over 15 percent, forb cover greater than that of sedges, rushes or grasses.....
.....False Hellebore-Common Cowparsnip FW51 11 p. 140
14. Sedges, rushes, or grasses dominant..... (15)

15. Cover of forbs nearly equal to that of sedges and rushes.....
.....Sedge-Twinflower Marshmerigold MM39 11 p. 150
15. Sedges and rushes dominate.....
.....Sedge-Panicled Bulrush (hydric) MT19 11 p. 148

16. Huckleberries or blueberries codominant with spirea..... (17)
16. Spirea and willows dominant.....
.....Spirea-Willow/Sedge SW41 23 p. 156

17. Sedges and forbs more abundant than grasses.....
.....Douglas Spirea-Bog Blueberry/Sedge (hydric) SW41 22 p. 138
17. Grasses prominent, cover usually equal to or greater than sedges and forbs.....Blueberry-Subalpine Spirea/Grass SW41 21 p. 132

18. Beargrass common .....Beargrass-Red Fescue FM29 11 p. 130
18. Beargrass minor..... (19)

19. Thimbleberry and/or pokeweed fleeceflower common.....
.....Thimbleberry-Pokeweed Fleeceflower SM59 11 p. 160
19. Thimbleberry and pokeweed fleeceflower minor..... (20)

20. Vetches and fleabanes common, forb cover generally greater than grass cover.....Common
Vetch-Peregrine Fleabane-Blue Wildrye (xeric) FM30 11 p. 136
20. Vetches and fleabanes uncommon, grass cover often greater than forb cover..... (21)

21. Blue wildrye and brome grasses common.....
.....Blue Wildrye-Brome GM41 21 p. 134
21. Non-forest type not sampled and not included in this guide.

Table 6. List of TRI abbreviations (Garrison et al. 1976), scientific (Hitchcock and Cronquist 1973) and common names of trees, shrubs and herbs used in the key and association descriptions. Species with missing codes or common names were not included in Garrison et al. (1976). An asterisk next to species code indicates species used in the keys to plant associations or community types.

TREES

CODE	SCIENTIFIC NAME	COMMON NAME	INDICATION
ABAM *	Abies amabilis	Pacific silver fir	cool
ABCO	Abies concolor	White fir	
ABGR	Abies grandis	Grand fir	
ABLA2*	Abies lasiocarpa	Subalpine fir	cool
ABMAS	Abies procera shastensis	Shasta red fir	
ABPR *	Abies procera	Noble fir	
ACMA	Acer macrophyllum	Bigleaf maple	
ALRU	Alnus rubra	Red alder	
ARME	Arbutus menziesii	Madrone	dry, warm
CACH	Castanopsis chrysophylla	Chinquapin	dry
CADE	Calocedrus decurrens	Incense cedar	hot
CHNO	Chamaecyparis nootkatensis	Alaska cedar	cold, wet
LAOC	Larix occidentalis	Western larch	
PIAL	Pinus albicaulis	Whitebark pine	very cold
PIEN	Picea engelmannii	Engelmann spruce	cold
PICO	Pinus contorta	Lodgepole pine	
PILA	Pinus lambertiana	Sugar pine	
PIMO	Pinus monticola	Western white pine	
PIPO	Pinus ponderosa	Ponderosa pine	hot, dry
PREM	Prunus emarginata	Bitter cherry	
PSME	Pseudotsuga menziesii	Douglas-fir	
QUGA *	Quercus garryana	Oregon white oak	hot, dry
TABR	Taxus brevifolia	Pacific yew	
THPL	Thuja plicata	Western redcedar	
TSHE *	Tsuga heterophylla	Western hemlock	
TSME *	Tsuga mertensiana	Mountain hemlock	cold

SHRUBS

CODE	SCIENTIFIC NAME	COMMON NAME	INDICATION
ACCI *	Acer circinatum	Vine maple	
ACGLD	Acer glabrum douglasii	Rocky Mt. maple	
ALSI *	Alnus sinuata	Sitka alder	
AMAL	Amalanchier alnifolia	Serviceberry	
ARCO3	Arctostaphylos columbiana	Hairy manzanita	
ARNE	Arctostaphylos nevadensis	Pinemat manzanita	dry
ARPA	Arcotstaphylos patula	Greenleaf manzanita	dry
ARUV *	Arctostaphylos uva-ursi	Bearberry	dry
ARLU	Artemisia ludoviciana	Louisiana sagebrush	
BEAQ *	Berberis aquifolium	Tall Oregon grape	warm, dry
BENE *	Berberis nervosa	Dwarf Oregon grape	
CACH	Castanopsis chrysophylla	Chinquapin	warm
CEIN	Ceanothus integerrimus	Deerbrush ceanothus	disturbance
CEVE	Ceanothus velutinus	Snowbrush	disturbance
CHME	Chimaphila menziesii	Little prince's pine	
CHUM *	Chimaphila umbellata	Prince's pine	
COCO2	Corylus cornuta	California hazel	warm
CONU	Cornus nuttallii	Pacific dogwood	warm
COST	Cornus stolonifera	Red-osier dogwood	
GAOV	Gaultheria ovatifolia	Wintergreen	
GASH *	Gaultheria shallon	Salal	
HODI	Holodiscus discolor	Oceanspray	dry
HODU	Holodiscus dumosus	Bush rockspirea	dry, cool
JUCO4	Juniperus communis	Common juniper	
LOHI	Lonicera hispidula	Hairy honeysuckle	hot, dry
MEFE *	Menziesia ferruginea	Fool's huckleberry	cool
OECE	Oemelaria cerasiformis	Osoberry	
OPHO *	Oplopanax horridum	Devil's club	wet
PAMY	Pachistima myrsinites	Oregon boxwood	
PHLE2*	Philadelphus lewisii	Mockorange	dry
RHPU	Rhamnus purshiana	Cascara buckthorn	
RHAL *	Rhododendron albiflorum	Cascades azalea	cold,wet
RHMA *	Rhododendron macrophyllum	Rhododendron	
RHDI *	Rhus diversiloba	Poison oak	hot, dry
RIBES	Ribes spp.	Gooseberry	
RIBR	Ribes bracteosum	Stink currant	
RICR	Ribes cruentum	Shinyleaf gooseberry	
RILA	Ribes lacustre	Prickly currant	
RISA	Ribes sanguineum	Winter currant	
ROGY *	Rosa gymnocarpa	Baldhip rose	
RULA	Rubus lasiococcus	Dwarf bramble	cool
RULE	Rubus leucodermis	Black raspberry	
RUNI	Rubus nivalis	Snow dewberry	
RUPA *	Rubus parviflorus	Thimbleberry	
RUPE	Rubus pedatus	Five-leaved blackberry	cool
RUSP	Rubus spectabilis	Salmonberry	warm, wet
RUUR	Rubus ursinus	Trailing blackberry	warm
SALIX	Salix spp.	Willows	

CODE	SCIENTIFIC NAME	COMMON NAME	INDICATION
SALA2	Salix lasiandra	Pacific willow	
SARA	Sambucus racemosa	European red elder	
SOSI	Sorbus sitchensis	Sitka mountain ash	
SPDE *	Spiraea densiflora	Subalpine spirea	cool, moist
SPDO *	Spiraea douglasii	Douglas spirea	cool, moist
SYAL	Symphoricarpos albus	Common snowberry	
SYOR	Symphoricarpos oreophilus	Mountain snowberry	
SYMO *	Symphoricarpos mollis	Snowberry (trailing)	warm, dry
VACCI*	Vaccinium spp.	Huckleberry species	
VAAL *	Vaccinium alaskaense	Alaska huckleberry	cool
VACA	Vaccinium caespitosum	Dwarf blueberry	
VAME *	Vaccinium membranaceum	Big huckleberry	cool-cold
VAOC2	Vaccinium occidentale	Western bog-blueberry	
VAOV *	Vaccinium ovalifolium	Oval-leaf huckleberry	cool
VAPA	Vaccinium parvifolium	Red huckleberry	warm
VASC *	Vaccinium scoparium	Grouse huckleberry	cold, dry
VAUL *	Vaccinium uliginosum	Bog Blueberry	cool, wet
WHMO *	Whipplea modesta	Whipple vine	warm, dry

HERBS AND GRASSES

CODE	SCIENTIFIC NAME	COMMON NAME	INDICATION
ACMI	Achillea millifolium	Western yarrow	
ACTR *	Achlys triphylla	Vanilla leaf	moist
ACRU	Actaea rubra	Baneberry	
ADBI	Adenocaulon bicolor	Pathfinder	
ADPE	Adiantum pedatum	Maidenhair fern	wet
AGAU	Agoseris aurantiaca	Orange agoseris	
AGDI	Agrostis diegoensis	Thin bentgrass	
AGEX	Agrostis exarata	Spike bentgrass	
AGHA	Agrostis hallii	Hall's bentgrass	
AGTH	Agrostis thurberiana	Thurber bentgrass	
AIEL	Aira elegans	Elegant hairgrass	
ALLIU	Allium spp.	Onion	
ALCA	Allium campanulatum	Sierra onion	
ALCR	Allium crenulatum	Scalloped onion	
ANDE	Anemone deltoidea	Three-leaved anemone	moist
ANLY2	Anemone lyallii	Nine-leaved anemone	moist
ANGE	Angelica genuflexa	Kneeling angelica	
ANMI	Antennaria microphylla	Rosy pussytoes	
AQFO	Aquilegia formosa	Sitka columbine	
ARCA3	Aralia californica	California aralia	
ARMA3	Arenaria macrophylla	Bluntleaf sandwort	
ARLA	Arnica latifolia	Broadleaf arnica	

CODE	SCIENTIFIC NAME	COMMON NAME	INDICATION
ASCA3	Asarum caudatum	Wild ginger	moist
ASDE	Aspidotis densa	Aspidotis	
ASTER	Aster spp.	Aster	
ASAL	Aster alpigenus	Alpine aster	
ASGO	Aster gormanii	Gorman's aster	
ATFI	Athyrium filix-femina	Ladyfern	moist, wet
BLSP	Blechnum spicant	Deerfern	moist
BOMU	Botrychium multifidum	Leathery grapefern	
BOMA	Boykinia major	Sierra boykinia	
BROMU*	Bromus spp.	Brome	
BRCA	Bromus carinatus	California brome	
BRIN	Bromus inermis	Smooth brome	
BRTE	Bromus tectorum	Cheatgrass brome	
CACA	Calamagrostis canadensis	Bluejoint reedgrass	
CALOC	Calochortus spp.	Sego lily	
CABI *	Caltha biflora	Twinflower marshmerigold	
CABU2	Calypso bulbosa	Calypso orchid	
CAMAS	Camassia spp.	Camas	
CALE	Camassia lechtlinii	Lechtlin's camas	
CASC2	Campanula scouleri	Scouler's bluebell	
CAREX*	Carex spp.	Sedge	
CACO5	Carex comosa	Bristly sedge	
CAHY	Carex hystricina	Porcupine sedge	
CALE5	Carex lenticularis		
CALU	Carex luzulina	Woodrush sedge	
CAME2	Carex mertensii	Merten's sedge	
CAMU2	Carex muricata	Muricate sedge	
CAOB	Carex obnupta	Slough sedge	
CAPE5	Carex pensylvanica	Long-stolon sedge	
CASA2	Carex saxatilis	Russet sedge	
CASI3	Carex sitchensis	Sitka sedge	
CATU	Carex tumulicola	Foothills sedge	
CAVE	Carex vesicaria	Blister sedge	
CERAS	Cerastium spp.	Chickweed	
CHGR	Cheilanthes gracillima	Lace lipfern	
CIDO	Cicuta douglasii	Western water-hemlock	
CIAL	Circaea alpina	Alpine circaea	
CIRSI	Cirsium spp.	Thistle	
CLUN *	Clintonia uniflora	Queencup beadlily	cool, moist
COHE	Collomia heterophylla	Varied-leaf collomia	
COLA	Coptis laciniata	Goldthread	moist
COMA3	Corallorhiza maculata	Coral-root	
COCA *	Cornus canadensis	Dogwood bunchberry	cool, moist
COCAC	Corydalis caseana cusickii	Case's corydalis	
CRMU	Crocidium multicaule	Spring-gold	

CODE	SCIENTIFIC NAME	COMMON NAME	INDICATION
CRCR	Cryptogramma crispa	Rockbrake	dry, rocky
DANTH	Danthonia spp.	Danthonia	
DAIN	Danthonia intermedia	Timber danthonia	
DECA	Deschampsia caespitosa	Tufted hairgrass	
DIFO	Dicentra formosa	Pacific bleeding heart	moist
DIHO	Disporum hookeri	Fairybells	
DODEC	Dodecatheon spp.	Shootingstar	
DOJE	Dodecatheon jeffreyi	Jeffrey shootingstar	
DROSE	Drosera spp.	Sundew	
DRRO	Drosera rotundifolia	Sundew	
DRAU2	Dryopteris austriaca	Shield-fern	
ELGL *	Elymus glauca	Blue wildrye	
EPGL	Epilobium glaberrimum	Smooth willowweed	
EPGL2	Epilobium glandulosum	Common willowweed	
EPMI	Epilobium minutum	Small-flowered willoweed	
ERCO5	Eriogonum compositum	Northern eriogonum	
ERMA2	Eriogonum marifolium	Mountain eriogonum	
ERNU	Eriogonum nudum	Barestem eriogonum	
ERUM	Eriogonum umbellatum	Sulphur eriogonum	
ERPO2	Eriophorum polystachion	Many-spiked cottongrass	
ERLA	Eriophyllum lanatum	Woolly eriophyllum	
ERMO *	Erythronium montanum	Avalanche lily	cold
EQUIS	Equisetum spp.	Horsetail	moist
ERCA3	Erigeron cascadensis	Cascades fleabane	
ERPE *	Erigeron peregrinus	Peregrine fleabane	
EROR	Erythronium oregonum	Giant fawnlily	warm
FECA	Festuca californica	California fescue	
FEID	Festuca idahoensis	Idaho fescue	
FEOC	Festuca occidentalis	Western fescue	
FEOV	Festuca ovina	Sheep fescue	
FERU *	Festuca rubra	Red fescue	
FESU	Festuca subulata	Bearded fescue	
FRAGA	Fragaria spp.	Strawberry	
FRVE	Fragaria vesca	Strawberry	
FRUM	Frasera umpquaensis	Umpqua frasera	
FRLA	Fritillaria lanceolata	Riceroot fritillary	
GAAP	Galium aparine	Catchweed bedstraw	
GAOR	Galium oreganum	Oregon bedstraw	
GATR	Galium triflorum	Sweetscented bedstraw	
GEMA	Geum macrophyllum	Largeleaf avens	
GLGR	Glyceria grandis	American mannagrass	
GOOB	Goodyera oblongifolia	Rattlesnake plantain	
GYDR	Gymnocarpium dryopteris	Oak fern	moist
HADI2	Habenaria dilatata	White bog-orchid	
HAUN	Hebenaria unalasensis	Alaska habenaria	
HAHA	Haplopappus hallii	Hall's goldenweed	
HELA *	Heracleum lanatum	Common cowparsnip	
HEUCH	Heuchera spp.	Alumroot	

CODE	SCIENTIFIC NAME	COMMON NAME	INDICATION
HIAL	Hieracium albiflorum	White hawkweed	
HIOD	Hierocloe odorata	Seneca grass	
HYCA	Hydrophyllum capitatum	Ballhead waterleaf	
HYTE	Hydrophyllum tenuipes	Pacific waterleaf	
HYAN	Hypericum anagalloides	Trailing St. Johnswort	
HYFO	Hypericum formosum	Western St. Johnswort	
HYMO	Hypopitys monotropa	Pinesap	
JUBA	Juncus balticus	Baltic rush	
JUEN	Juncus ensifolius	Swordleaf rush	
JUPA	Juncus parryi	Parry rush	
JUPA2	Juncus patens	Spreading rush	
IRTE	Iris tenax	Oregon iris (purple)	
LICO4	Lilium columbianum	Columbia lily	
LIBO2*	Linnaea borealis	Twinflower	
LIBO	Listera borealis	Twayblade	
LOHA	Lomatium hallii	Hall's lomatium	
LOTR	Lomatium triternatum	Nineleaf lomatium	
LOUT	Lomatium utriculatum	Pomo-celery lomatium	
LUZUL	Luzula spp.	Luzula	
LYSI	Lycopodium sitchense	Alaska clubmoss	
LYAM	Lysichitum americana	American yellow skunkcabbage	
MADI2	Maianthemum dilatatum	False lily-of-the-valley	moist
MECA2	Mertensia campanulata	Idaho bluebells	
MIMUL	Mimulus spp.	Monkeyflower	
MIAL	Mimulus alsinoides	Chickweed monkeyflower	
MIGU	Mimulus gutattus	Common monkeyflower	
MIBR	Mitella breweri	Brewer miterwort	moist
MOSI	Montia sibirica	Miner's lettuce	moist
NEME	Nemophila menziesii	Baby blue-eyes	
NEPA	Nemophila paviflora	Smallflower nemophila	
OPVU	Ophioglossum vulgatum	Adder's tongue	
OSCH	Osmorhiza chilensis	Sweet cicely	
OXOR *	Oxalis oregana	Oregon oxalis	moist
PEDA	Penstemon davidsonii	Davidson penstemon	
PERU	Penstemon rupicola	Cliff penstemon	
PEGR	Pedicularis groenlandica	Elephanthead pedicularis	
PERA	Pedicularis racemosa	Sickletop pedicularis	cool, moist
PHHE *	Phacelia heterophylla	Varileaf phacelia	
PLRE	Pleuropogon refractus	Nodding semaphoregrass	
POPH *	Polygonum phytolaccefolium	Pokeweed fleeceflower	
POLYP	Polypodium spp.	Licorice fern	
POAN3	Polystichum andersonii	Anderson's swordfern	
POLO2	Polystichum lonchitis	Mountain hollyfern	
POMU	Polystichum munitum	Swordfern	
POTEN	Potentilla spp.	Cinquefoil	
PTAQ	Pteridium aquilinum	Bracken fern	disturbance
PYPI	Pyrola picta	White vein pyrola	
PYSE	Pyrola secunda	Sidebells pyrola	cool, dry

CODE	SCIENTIFIC NAME	COMMON NAME	INDICATION
PYAS	Pyrola asarifolia	Alpine pyrola	
ROCA	Romanzoffia californica	California mistmaiden	
ROTH	Romanzoffia thompsonii	Thompson's mistmaiden	
SADO	Satureja douglasii	Yerba buena	warm, dry
SALY	Saxifraga lyallii	Lyall saxifrage	
SAME3	Saxifraga mertensiana	Mertens saxifrage	
SAOC3	Saxifraga occidentalis	Western saxifrage	
SCMI *	Scirpus microcarpus	Panicled bulrush	
SCHA	Scoliopus hallii	Fetid adders-tongue	
SEDI	Sedum divergens	Spreading stonecrop	
SEOR3	Sedum oregonense	Creamy stonecrop	
SESP	Sedum spathulifolium	Spatula-leaf stonecrop	
SEWA2	Selaginella wallacei	Wallace selaginella	
SETR	Senecio triangularis	Arrowleaf groundsel	
SICU	Sidalcea cusickii	Cusick's checkermallow	
SISE2	Sidalcea setosa		
SIHY	Sitanion hysterix	Bottlebrush squirreltail	
SMRA	Smilacina racemosa	Feather solomonplume	moist
SMST *	Smilacina stellata	False solomonseal	moist
STCO4	Stachys cooleyae	Cooley's betony	
STOC	Stipa occidentalis	Western needlegrass	
STRO *	Streptopus roseus	Rosy twistedstalk	moist
SYRE	Synthyris reniformis	Snow queen	warm, dry
THLI	Thelypteris limbosperma	Mountain wood-fern	
TITR *	Tiarella trifoliata	Coolwort foamflower	moist
TOGL	Tofieldia glutinosa	Tofieldia	
TOME	Tolmiea menziesii	Menzie's tolmiea	
TRAR2	Trientalis arctica	Northern starflower	
TRLA2	Trientalis latifolia	Western starflower	
TROV	Trillium ovatum	Pacific trillium	
VASI	Valeriana sitchensis	Sitka valerian	moist, cool
VAHE *	Vancouveria hexandra	Inside-out-flower	
VERAT*	Veratrum spp.	False hellebore	
VECA	Veratrum californicum	California false hellebore	
VEVI	Veratrum viride	American false hellebore	
VISA *	Vicia sativa	Common vetch	
VIOLA	Viola spp.	Violet	
VIGL	Viola glabella	Pioneer violet	moist
VIOR2	Viola orbiculata	Vetch violet	moist
VISE	Viola sempervirens	Redwoods violet	
XETE *	Xerophyllum tenax	Beargrass	cold, dry

Environmental indication is strong when several similar species are present and their cover is high. Opposite indications should be weighed by number of indicators present and their percent cover.

EXPLANATION OF ASSOCIATION DESCRIPTIONS

The association descriptions in this field guide summarize the major points from association descriptions in the desk guide. Each description is two pages long. The first page is a set of line drawings of the plants which characterize the association. The second page has sections for 1) the common name, TRI acronym, and ecoclass code for the association, 2) the basic physical features, 3) soils characteristics, 4) major plant species average cover and constancy, 5) management implications, 6) conifer site index, growth basal area and forage amounts.

The common names and TRI acronyms are according to Garrison et al. (1976). The ecoclass codes were assigned by the Regional Ecologist and should be used whenever plant association is entered into the TRI system.

The mean and range of values encountered in our sample plots are provided for elevation (feet) and slope (percent slope). Aspect is listed by quadrant from most common to least common. Aspects in parentheses are less common. Landforms given are the most typical for the type. Not all sites should be expected to fall within the general physical features listed.

Soils characteristics provided are from a relatively small sample of soil pits in each type. Mean total depth and mean effective rooting depth (both in inches) are followed by the range of values we encountered.

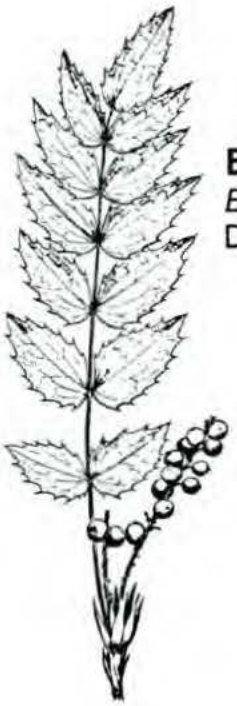
Plant species are listed for the species which characterize the association. Cover is averaged over the plots in which the species occurred. Constancy is the proportion of our sample plots in which the species occurred. If more information on species composition would be helpful, consult the vegetation tables in the appendix.

The management summary section is condensed from the desk guide. Consult the desk guide if there are questions.

Productivity data includes the site index and standard error (SE) of Douglas-fir (100 year base, McArdle et al. 1961 or Curtis et al. 1974) and Noble fir (100 year base, Herman et al. 1978). Forage amounts given are pounds per acre green weight. Herbage includes all above ground parts of all herbs. Shrub forage amounts includes the leaves and current year twigs from ground level to 5 feet above the ground for the major species.

ASSOCIATION DESCRIPTIONS

Douglas-fir / oceanspray - dwarf Oregon grape
PSME / HODI - BENE
CDS2 11



BENE
Berberis nervosa
Dwarf Oregon grape

POMU
Polystichum munitum
Swordfern

HODI
Holodiscus discolor
Oceanspray

SYMO
Symphoricarpos mollis
Snowberry (trailing)

SYRE
Synthyris reniformis
Snow queen

Douglas-fir/oceanspray - dwarf Oregon grape
PSME/HODI - BENE
CDS2 11

Elevation: 2458, 1400-4280
% Slope: 56, 20-90
Aspect: South, Southwest, West.
Landform: Steep, and rocky or moderate slopes with deep clays.
Soils: Thin and rocky or heavy clay. Coarse fragments abundant. SRI units 3, 9, 33 & 61.

Total soil depth: 30, 21-40
Effective depth: 25, 15-32

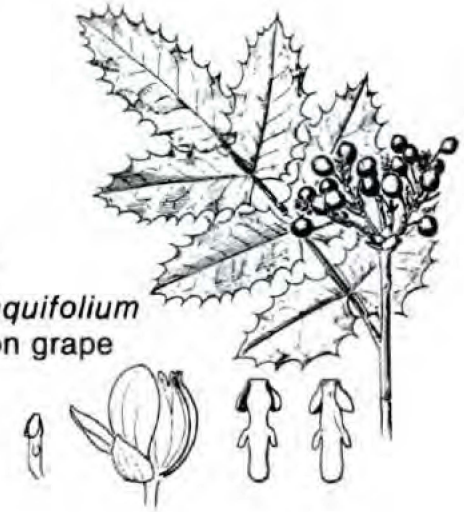
Dominants	Cov	Cons
PSMEM	58	100
ARMEM	4	56
CADEM	10	50
ABGRR	7	31
PSMER	8	50
.....		
BENE	26	100
WHMO	5	94
SYMO	5	94
HODI	10	75
.....		
POMU	4	94
HIAL	1	94
SYRE	3	88
ANDE	1	81

This association occurs on relatively steep south or west-facing slopes between 2000 and 3000 ft. elevation. The overall environment is hot and dry. Soils are thin and rocky or deep, heavy clay. The growing season is long with substantial drought developing by mid-summer. Severe growing conditions limit tree growth. Sugar pine seems to grow substantially better than Douglas-fir. Regeneration in clearcuts can be difficult due to heat, drought, and competition from grasses. Survival of Douglas-fir seedlings should be best in shade. Slash fires should not consume the duff and litter layers as dry ravel may be accelerated, reducing the already low nitrogen levels on skeletal soils. Most sites provide big game winter range.

	Site Index Douglas-fir	Basal Area sq ft/ac	Herbage lbs/ac	Vine Maple	Salal	Rhodo-dendron	Dwarf Oregon Grape
				forage lbs/ac			
Mean	115	275	10	-	-	-	12
SE	3	13	10	-	-	-	12

Douglas-fir / oceanspray / grass
PSME / HODI / GRASS
CDS2 12

HODI
Holodiscus discolor
Oceanspray



BEAQ
Berberis aquifolium
Tall Oregon grape

HIAL
Hieracium albiflorum
White hawkweed

FECA
Festuca californica
California fescue

FESU
Festuca subulata
Bearded fescue

Douglas-fir / oceanspray / grass
PSME / HODI / GRASS
CDS2 12

Elevation: 2622, 2250-3140
% Slope: 53, 15-80
Aspect: Southwest.
Landform: Southerly aspects on moderately steep slopes.

Soils: Thin and rocky or deep, heavy clay. SRI unit 33 is most common.

Total soil depth: 35, 24-47
Effective depth: 31, 18-39

Dominants	Cov	Cons
PSMEM	68	100
ACMAM	6	67
PSMER	3	44
.....		
ROGY	2	89
SYMO	3	78
BEAQ	3	78
HODI	4	78
.....		
HIAL	1	100
FRVE	4	78
TRLA2	3	78
ARMA3	2	78

This association occurs on the warmest, driest forested sites. It is most common on the Rigdon Ranger District. A long, dry growing season and relatively mild winters are characteristic of this type. Regeneration is difficult, especially in clearcuts. Shade is essential for Douglas-fir survival. Sugar pine and ponderosa pine generally survive and grow better than Douglas-fir. Once established, Dougalas-fir grows well. Slash fires that consume the duff accelerate dry ravel and reduce soil nitrogen levels. This plant association provides valuable big game winter range. Elk use is often high

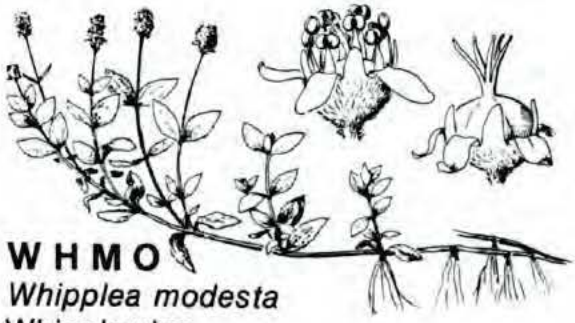
	Site Index Douglas-fir	Basal Area sq ft/ac	Herbage lbs/ac	Vine Maple	Salal	Rhodo-dendron	Oregon Grape
				forage lbs/ac			
Mean	121	275	169	3			27
SE	1	13	58	3			20

Douglas-fir / oceanspray - whipple vine

PSME / HODI - WHMO

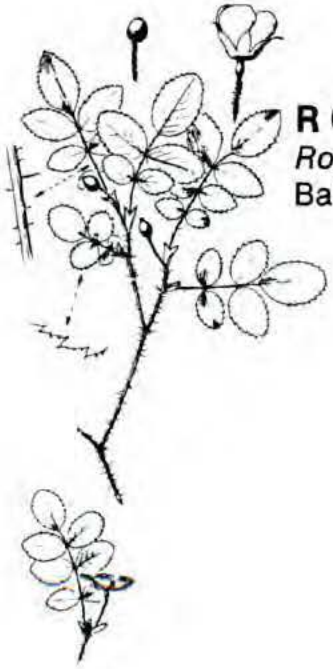
CDS2 13

HODI
Holodiscus discolor
Oceanspray



WHMO
Whipplea modesta
Whipple vine

FRVE
Frageria vesca
Strawberry



ROGY
Rosa gymnocarpa
Baldhip rose

POMU
Polystichum munitum
Swordfern

Douglas-fir / oceanspray - whipple vine
PSME / HODI - WHMO
CDS2 13

Elevation: 2382, 1400-3800
% Slope: 51, 3-98
Aspect: Southwest, Southeast.
Landform: Southerly-facing steep slopes.

Soils: Skeletal and rocky or deep clay. SRI units 23 & 61 are most common.

Total soil depth: 41, 21-60
Effective depth: 31, 14-46

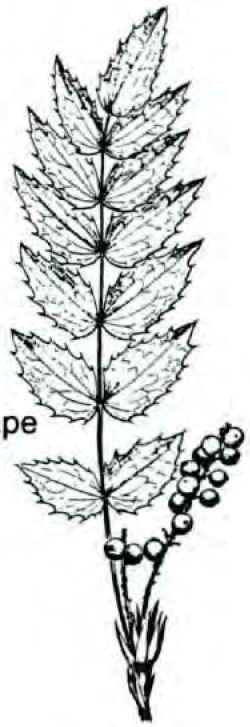
Dominants	Cov	Cons
PSMEM	51	100
CADEM	17	54
PSMER	12	54
CADER	6	46
ABGRR	5	46
.....		
WHMO	20	100
ROGY	4	100
HODI	10	77
BENE	7	77
.....		
POMU	6	85
FRVE	2	77
ADBI	2	69

This association is most common on the Rigdon Ranger District but occurs across the Forest. Growing seasons are long and dry. Shallow or clay soils contribute to the development of moisture stress by mid-summer. Regeneration is difficult, especially in clearcuts. Douglas-fir seedlings may require shading. Sugar pine and ponderosa pine may be better choices for planting in openings. Hot slash fires could accelerate dry ravel and cause soil nitrogen losses. Big game use for winter range is often high.

	Site Index Douglas-fir	Basal Area sq ft/ac	Herbage lbs/ac	Vine Maple forage	Salal forage	Rhodo-dendron lbs/ac	Oregon Grape lbs/ac
Mean	106	283	120	-	6	-	2
SE	4	18	59	-	6	-	2

Douglas-fir / snowberry
PSME/ SYMO — WILL
CDS6 41

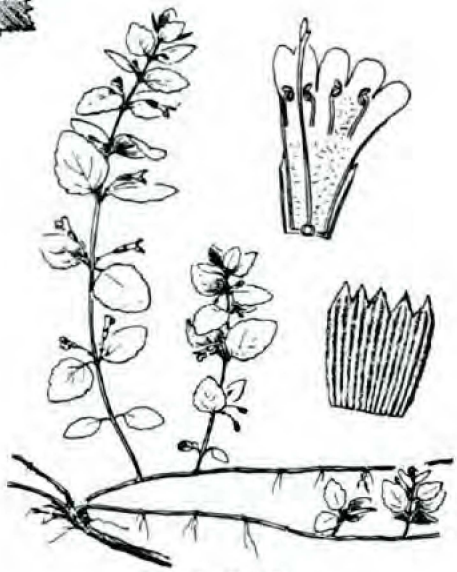
SYMO
Symphoricarpos mollis
Snowberry (trailing)



BENE
Berberis nervosa
Dwarf Oregon grape

COCO2
Corylus cornuta
California hazel

TRLA 2
Trientalis latifolia
Western starflower



SADO
Satureja douglasii
Yerba buena

Douglas-fir / snowberry
PSME / SYMO — WILL
CDS6 41

Elevation: 2164, 1140-3600
% Slope: 34, 10-55
Aspect: Southwest.
Landform: Gentle to moderately steep south or west facing slopes.
Soils: Often skeletal or clay developed in colluvium. SRI Units 23 and 33 most common.

Total soil depth: 26, 16-35
Effective depth: 19, 12-26

Dominants	Cov	Cons
PSMEM	72	100
ARMEM	19	57
PSMER	2	86
CADER	3	57
ABGRR	3	57
.....		
SYMO	37	100
BENE	6	100
COCO2	6	100
ROGY	6	86
.....		
TRLA2	2	86
FRVE	2	71
SADO	1	71

This association usually occurs below 2500 feet elevation. Most sites are free of snow most of the year. Significant moisture stress develops by mid-summer. Most of our sample stands were young, indicating recent fire. Regeneration may be limited by heat and drought. Douglas-fir should survive well on most sites. Shading may be required on steep, south-facing slopes. Once established, growth should be rapid. Sugar pine should grow well on most sites. Competition from grasses, bitter cherry, and Ceanothus species may develop if regeneration is delayed. Slash fires should be cool. Winter wildlife use is often high. Evidence of big game use may be found on most sites.

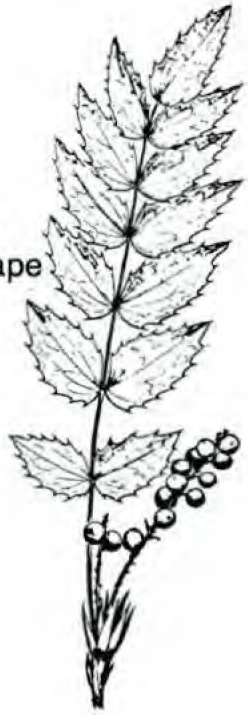
	Site Index Douglas-fir	Basal Area sq ft/ac	Herbage lbs/ac	Vine Maple	Salal	Rhodo-dendron	Oregon Grape
				forage lbs/ac			
Mean	123	323	92	2	-	-	26
SE	6	61	63	2	-	-	24

Douglas-fir - western hemlock / dwarf Oregon grape

PSME - TSHE / BENE

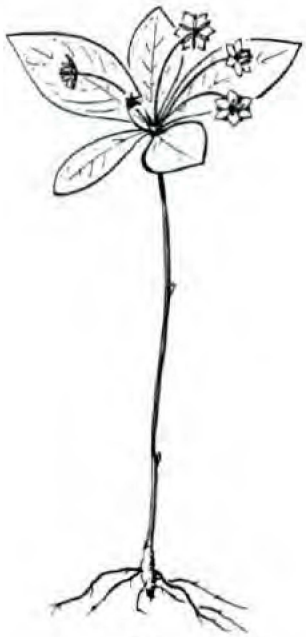
CDC7 11

SYMO
Symphoricarpos mollis
Snowberry (trailing)



BENE
Berberis nervosa
Dwarf Oregon grape

ROGY
Rosa gymnocarpa
Baldhip rose



TRLA 2
Trientalis latifolia
Western starflower

HIAL
Hieracium albiflorum
White hawkweed

Douglas-fir - western hemlock/dwarf Oregon grape
PSME - TSHE/BENE
CDC7 11

Elevation: 2610, 1600-4150
% Slope: 45, 5-75
Aspect: Southwest, Southeast.
Landform: Moderately steep slopes between 2000-3000 ft.

Soils: Skeletal to relatively deep clay. SRI units 23, 35 and and 66 are common.

Total soil depth: 52, 37-60
Effective depth: 48, 25-60

Dominants	Cov	Cons
PSMEM	67	100
CADEM	18	65
PSMER	2	81
CADER	4	64
.....		
BENE	26	100
SYMO	4	73
RUUR	1	73
COCO2	9	69
.....		
TRLA2	2	88
HIAL	1	85
POMU	6	77
ADBI	3	73

This association occurs on warm, droughty sites. It is often transitional to the western hemlock/dwarf Oregon grape association. Declines in the abundance of dry-site indicating species, such as whipple vine, oceanspray and poison oak, and increases in swordfern indicate less droughty sites. Deep snowpacks do not usually accumulate. Drought may hinder regeneration. While Douglas-fir seedlings survive better in the shade, survival should be adequate in most clearcuts. Sugar pine and ponderosa pine may survive better than Douglas-fir. Once stands are established, growth rates are as high as those in the western hemlock zone.
Big game winter use is high. Wildlife use is high although thermal cover is low.

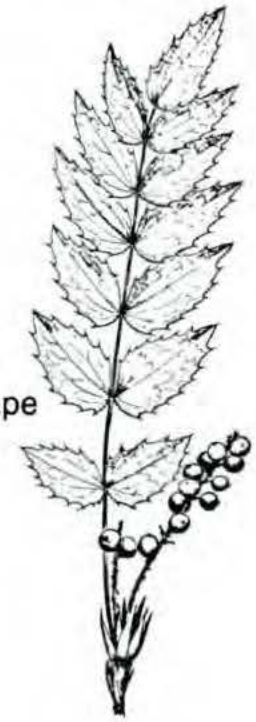
	Site Index Douglas-fir	Basal Area sq ft/ac	Herbage lbs/ac	Vine Maple forage	Salal forage	Rhodo-dendron lbs/ac	Oregon Grape lbs/ac
Mean	145	314	149	-	-	11	-
SE	2	19	108	-	-	11	-

Douglas-fir - western hemlock / rhododendron

PSME - TSHE / RHMA

CDC7 12

RHMA
Rhododendron macrophyllum
Rhododendron



BENE
Berberis nervosa
Dwarf Oregon grape

ROGY
Rosa gymnocarpa
Baldhip rose

GASH
Gaultheria shallon
Salal

POMU
Polystichum munitum
Swordfern

Douglas-fir - western hemlock/rhododendron
PSME - TSHE/RHMA
CDC7 12

Elevation: 2647, 1500-3550
% Slope: 42, 1-70
Aspect: Southerly.
Landform: Depressions or swales. Gentle to moderately steep slopes.
Soils: Moderately deep and stony. Some deep clay soils may occur.

Total soil depth: 57 (1 pit)
Effective depth: 52

Dominants	Cov	Cons
PSMEM	56	100
CACHM	15	72
ARMEM	14	64
PSMER	4	50
.....		
RHMA	39	100
GASH	39	100
BENE	13	100
ROGY	2	86
RUUR	1	86
WHMO	4	79
.....		
POMU	7	64
GATR	1	57

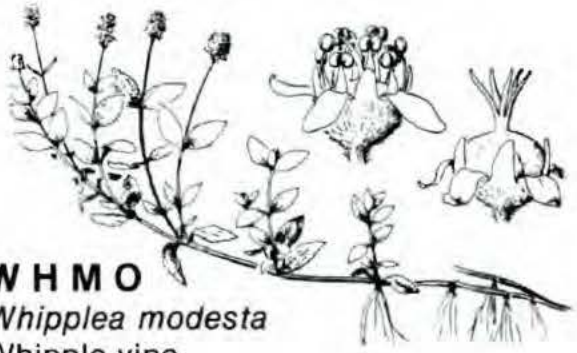
This uncommon association occurs at the south end of the Forest on relatively dry sites. It is occasionally transitional to the western hemlock/rhododendron-salal association. Douglas-fir should survive well when planted on most sites, but may require shade. Once established, Douglas-fir grows moderately well. Sample stands measured had relatively low basal areas and stand volumes. Early competition from shrubs and grasses may have limited stocking in natural stands. Competition for moisture from rhododendron, Ceanothus species and grass could be a problem for small seedlings on many sites. Since rhododendron dominated sites may be low in nitrogen, nitrogen fixing shrubs should be maintained in early seral stages. Wildlife values are not high.

	Site Index Douglas-fir	Basal Area sq ft/ac	Herbage lbs/ac	Vine Maple forage	Salal forage	Rhodo-dendron lbs/ac	Oregon Grape lbs/ac
Mean	133	270	116	2	78	36	36
SE	1	33	44	2	37	22	21

Douglas-fir - western hemlock / salal
PSME - TSHE / GASH
CDC7 13

B E N E
Berberis nervosa
Dwarf Oregon grape

G A S H
Gaultheria shallon
Salal



W H M O
Whipplea modesta
Whipple vine

R O G Y
Rosa gymnocarpa
Baldhip rose

P O M U
Polystichum munitum
Swordfern

Douglas-fir - western hemlock / salal
PSME - TSHE/GASH
CDC7 13

Elevation: 2251, 1220-3450
% Slope: 36, 2-78
Aspect: Southerly.
Landform: Moderate to steep slopes.

Soils: SRI units 16, 31, 35, 61 and 66. Shallow with high coarse fragment content.

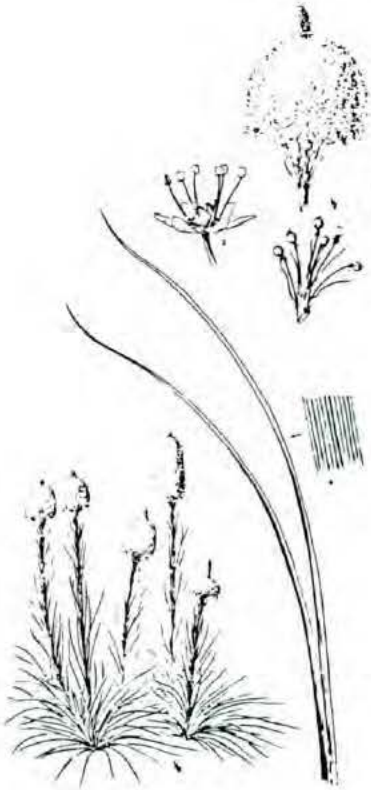
Total soil depth: 34, 24-41
Effective depth: 23, 18-30

Dominants	Cov	Cons
PSMEM	59	100
TSHEM	9	65
PSMER	4	73
TSHER	2	46
.....		
GASH	61	100
ROGY	2	88
RUUR	2	81
ACCI	21	73
.....		
POMU	4	88
VISE	3	62
TRLA2	2	58
GOOB	1	58

This association occurs throughout the Forest on dry sites. When found on gentle terrain, it indicates relatively low rainfall and unusual soil conditions such as heavy clay. The combination of environmental conditions found on these sites indicate slight winter snowpacks, rapid summer drying with high transpirational demands and a relatively long growing season. Drought and heat could make regeneration with Douglas-fir difficult. Douglas-fir seedlings should be shaded. Sugar pine and ponderosa pine survive and grow well. Once stands are established, growth rates are relatively good. Hot fires may accelerate dry ravel and reduce already low soil nitrogen levels. This type has the lowest wildlife use in the Douglas-fir zone, but greater than in most of the western hemlock series.

	Site Index Douglas-fir	Basal Area sq ft/ac	Herbage lbs/ac	Vine Maple forage lbs/ac	Salal forage lbs/ac	Rhodo-dendron forage lbs/ac	Oregon Grape forage lbs/ac
Mean	138	312	200	8	54	-	56
SE	1	25	62	3	32	-	34

Grand fir / bearberry
ABGR / ARUV
CWS5 21

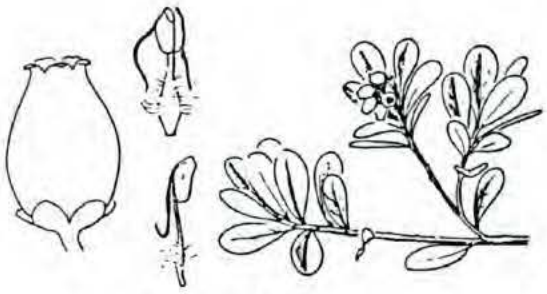


XETE
Xerophyllum tenax
Beargrass

ACTR
Achlys triphylla
Vanilla leaf

HODI
Holodiscus discolor
Oceanspray

ACCI
Acer circinatum
Vine maple



ARUV
Arctostaphylos uva-ursi
Bearberry

Grand fir/bearberry
ABGR/ARUV
CWS5 21

Elevation: 3544, 3120-3800
% Slope: 12, 0-45
Aspect: Northerly (All).
Landform: Rocky ridges, lava fields.

Soils: Shallow to moderately deep, stony. SRI 16 and 33 from two samples.

Total soil depth: 25, 16-33.
Effective depth: 18, 8-28.

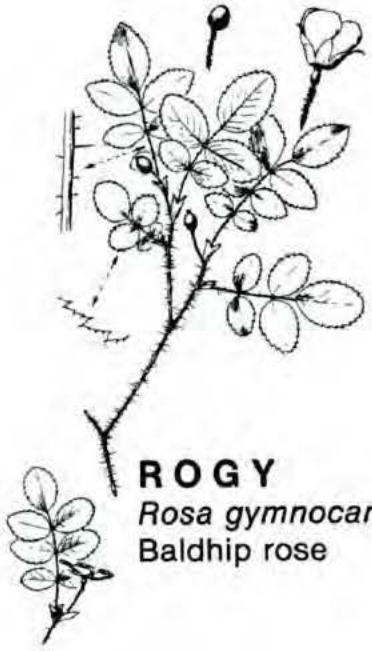
Dominants	Cov	Cons
PSMEM	23	100
ABRGM	2	50
ABGRR	2	100
.....		
ACCI	6	100
HODI	2	100
CACH	5	50
ARUV	25	50
.....		
ACTR	1	50

Most sites are dry, rocky ridges between 3000 and 4000 feet elevation or tree islands in lava fields. Tree growth is slow and regeneration difficult. Soils are often shallow and nutrient poor. They may also be unsiutable for timber harvest due to regeneration problems. Nitrogen may be in short supply and easily lost during moderately hot fires. Advanced regeneration is likely to be the only reliable source of seedlings. Wildlife use is sporadic. Little forage is available and sites are often exposed. Stands on lava are used more often because they may be the only vegetated habitat available.

	Site Index Douglas-fir	Basal Area sq ft/ac	Herbage lbs/ac	Vine Maple	Salal	Rhodo-dendron	Oregon Grape
				forage lbs/ac			
Mean	86	227	360	-	-	-	-
SE	1	42	360	-	-	-	-

Grand fir / dwarf Oregon grape
ABGR / BENE
CWS5 22

BENE
Berberis nervosa
Dwarf Oregon grape



ROGY
Rosa gymnocarpa
Baldhip rose

SYMO
Symphoricarpos mollis
Snowberry (trailing)

ACTR
Achlys triphylla
Vanilla leaf

DIHO
Disporum hookeri
Fairybells

Grand fir/dwarf Oregon grape
ABGR/BENE
CWS5 22

Elevation: 3006, 1800-4849
% Slope: 47, 2-99
Aspect: West.
Landform: Southerly-facing, relatively dry slopes.

Soils: Moderately deep to deep rocky or clay soils. SRI unit varies.

Total soil depth: 36, 18-60
Effective depth: 28, 10-46

Dominants	Cov	Cons
ABGRM	14	100
PSMEM	46	100
CADEM	17	67
ABGRR	7	89
.....		
BENE	31	100
ROGY	3	100
SYMO	4	83
ACCI	15	61
.....		
ACTR	4	83
ANDE	2	83
DIHO	2	83
LIBO2	10	78

Most sites occur on steep, rocky slopes, **dry glacial outwash**, or (at the south end of the Forest) deep clay. Douglas-fir, grand fir and sugar pine grow moderately well. Douglas-fir seedling survival may be limited by heat and drought. Shade may be necessary for seedling survival on some sites. Competition from Ceanothus species often develops after stand opening. Ceanothus species could be used for recharge of soil nitrogen and establishment of conifers. Detrimental nutrient loss may occur on rocky sites or glacial outwash following slash fires. This association often provides important winter range. Forage and thermal cover are more abundant than in most of the other dry-site associations.

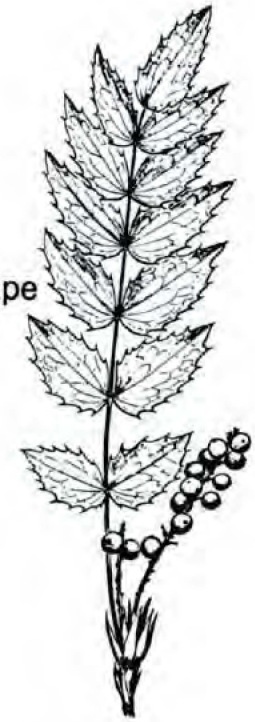
	Site Index Douglas-fir	Basal Area sq ft/ac	Herbage lbs/ac	Vine Maple forage lbs/ac	Salal forage lbs/ac	Rhodo-dendron forage lbs/ac	Oregon Grape forage lbs/ac
Mean	131	348	384	38	5	19	44
SE	1	11	139	31	5	7	22

Grand fir / prince's pine

ABGR / CHUM

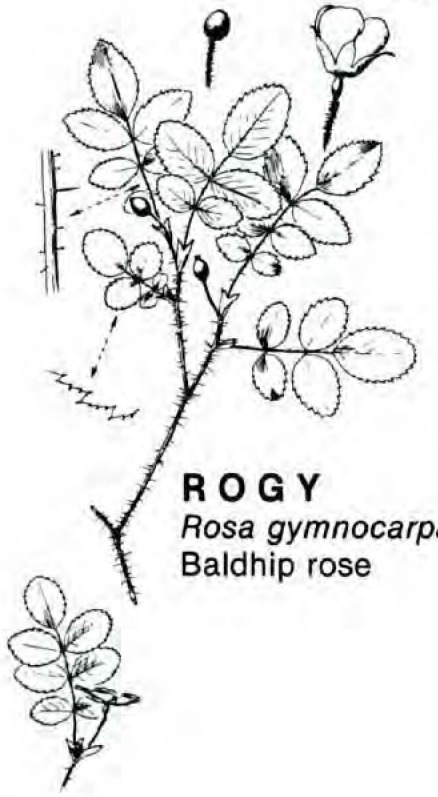
CWF2 11

CHUM
Chimaphila umbellata
Prince's pine



BENE
Berberis nervosa
Dwarf Oregon grape

GOOB
Goodyera oblongifolia
Rattlesnake plantain



ROGY
Rosa gymnocarpa
Baldhip rose

HIAL
Hieracium albiflorum
White hawkweed

Grand fir / prince's pine
ABGR/CHUM
CWF2 11

Elevation: 3515, 2900-3940
% Slope: 11, 0-14
Aspect: West, Northwest.
Landform: Gentle slopes.

Soils: SRI units indicate deep soils, often ashy.

Total soil depth: 44, 38-60
Effective depth: 34, 26-58

Dominants	Cov	Cons
PSMEM	68	100
ABGRM	17	83
ABGRR	9	100
TSHER	1	67
.....		
BENE	15	100
CHUM	28	100
ROGY	2	83
HODI	3	67
.....		
GOOB	1	100
ANDE	2	83
LIBO2	47	67
ACTR	7	67

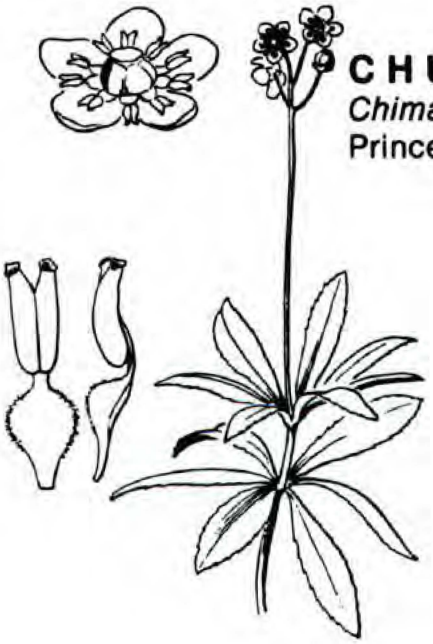
Most sites are above 3000 feet elevation. Douglas-fir, grand fir and noble fir grow well. Regeneration may be complicated by frost, drought and competition from Ceanothus species. Losses of duff and topsoil should be minimized because they contain a substantial portion of the available nitrogen. Wildlife use is moderate due to limited forage availability.

	Site Index Douglas-fir	Basal Area sq ft/ac	Herbage lbs/ac	Vine Maple forage	Salal forage	Rhodo-dendron lbs/ac	Oregon Grape lbs/ac
Mean	132	416	299	-	-	-	41
SE	1	31	124	-	-	-	16

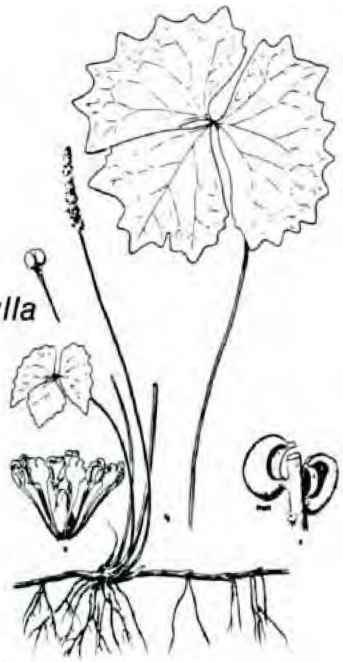
Pacific silver fir - grand fir / false solomonseal

ABAM - ABGR/SMST

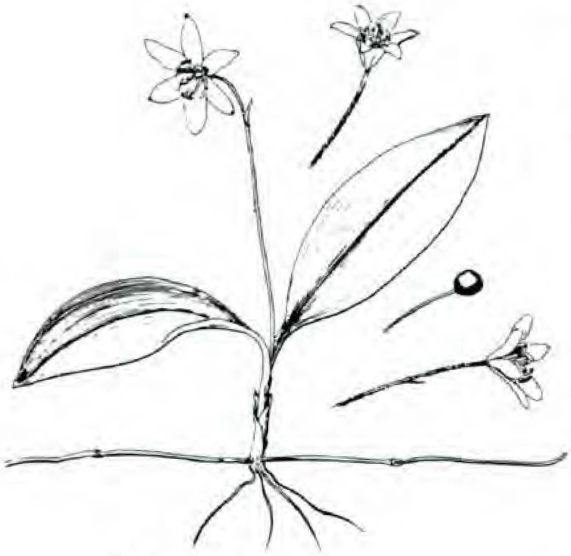
CFC3 11



CHUM
Chimaphila umbellata
Prince's pine



ACTR
Achlys triphylla
Vanilla leaf



CLUN
Clintonia uniflora
Queencup beadlily

SMST
Smilacina stellata
False solomonseal

VAME
Vaccinium membranaceum
Big huckleberry

Pacific silver fir - grand fir/false solomonseal
ABAM - ABGR/SMST
CFC3 11

Elevation: 4540, 3300-5200
% Slope: 33, 1-69
Aspect: Southerly.
Landform: Moderately steep slopes above 4000 feet elevation.

Soils: Variable from shallow to deep. Often rocky. SRI units 61, 66, 74 are common.

Total soil depth: 50, 16-99
Effective depth: 28, 3-57

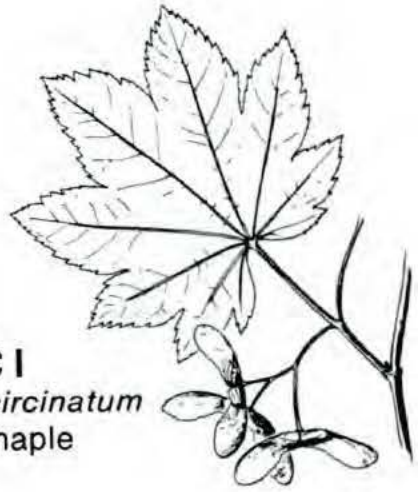
Dominants	Cov	Cons
PSMEM	28	95
ABAMM	12	88
ABAMR	11	98
TSHER	4	50
.....		
CHUM	8	73
VAME	9	68
.....		
SMST	22	100
ACTR	13	83
CLUN	8	73
TROV	2	60

This relatively uncommon association is transitional to the Pacific silver fir series. It indicates substantial winter snow accumulation, occasional growing season frost, and relatively moist soils. Conifer growth can be good. Noble fir grows especially well and tolerates occasional growing season frost better than Douglas-fir. Sites are not usually droughty, but regeneration can be difficult due to rocky soils, summer frost, and high evaporative demand. Soils should be resistant to adverse effects of moderately hot slash fires. Care should be taken to minimize loss of duff and topsoil, which contain a substantial share of the available nitrogen. Big game use this type extensively during summer. Herbaceous forage is abundant.

	Site Index Douglas-fir	Site Index Noble fir	GBA DF	GBA NF	Basal Area sq ft/ac	Herbage lbs/ac
Mean	133	-	496	416	365	1060
SE	2	-	96	-	46	34

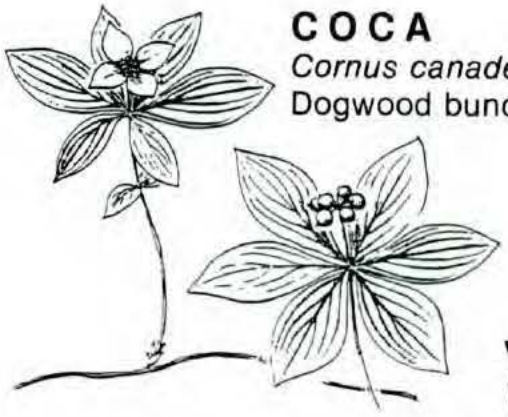
Pacific silver fir / Alaska huckleberry / dogwood bunchberry
ABAM / VAAL / COCA
CFS2 53

VAAL
Vaccinium alaskaense
Alaska huckleberry



ACCI
Acer circinatum
Vine maple

RULA
Rubus lasiococcus
Dwarf bramble



COCA
Cornus canadensis
Dogwood bunchberry

VAOV
Vaccinium ovalifolium
Oval-leaf huckleberry

Pacific silver fir / Alaska huckleberry / dogwood bunchberry
ABAM / VAAL / COCA
CFS2 53

Elevation: 3831, 2700-4500
% Slope: 27, 10-55
Aspect: NW to NE, SE.
Landform: Lower and mid-slopes, usually riparian.

Soils: Ofen rocky, developed from colluvium, residuum or tephra.

Total soil depth: 49, 18-75
Effective depth: 40, 4-64

Dominants	Cov	Cons
PSMEM	19	100
TSHEM	11	69
ABAMR	19	100
TSHER	8	77
.....		
VAAL	21	100
CHUM	7	85
ACCI	15	77
.....		
COCA	13	92
CLUN	9	85
TROV	2	85
ACTR	9	77

Most of our samples in this association are from old-growth stands in drainage bottoms or on benches near streams. The presence of moist-site indicating herbs combined with topographic position imply a cool, moist, well-drained environment. This type is moderately productive. Noble fir will probably produce more volume than Douglas-fir in managed stands. Regeneration may be complicated by frost but should not usually be difficult. In frost-prone areas, western white pine or Engelmann spruce should be planted. Soils often have deep duff accumulations which can help protect them from nutrient loss during slash fires. Watershed and wildlife values are often high. Big game trails are common and herbaceous forage is moderately high.

	Site Index Douglas-fir	Site Index Noble fir	GBA DF	GBA NF	Basal Area sq ft/ac	Herbage lbs/ac
Mean	102	110	394	407	355	305
SE	1	1	9	1	8	21

Pacific silver fir / Alaska huckleberry - salal

ABAM / VAAL - GASH

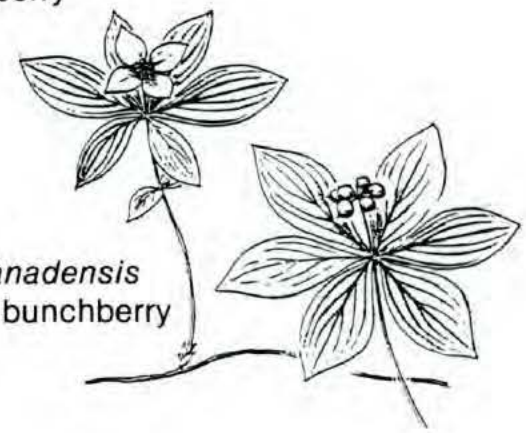
CFS2 55

VAAL
Vaccinium alaskaense
Alaska huckleberry

VAPA
Vaccinium parvifolium
Red huckleberry

GASH
Gaultheria shallon
Salal

VAOV
Vaccinium ovalifolium
Oval-leaf huckleberry



COCA
Cornus canadensis
Dogwood bunchberry

Pacific silver fir/Alaska huckleberry - salal
ABAM/VAAL - GASH
CFS2 55

Elevation: 3033, 2900-3200
% Slope: 10, 2-23
Aspect: All.
Landform: Dry lower slopes. Mudflows or glacial deposits.

Soils: Deep, stony, loamy sandy or clay loams over clay. Well-drained, dry.

Total soil depth: 70, 40-99
Effective depth: 33, 11-56

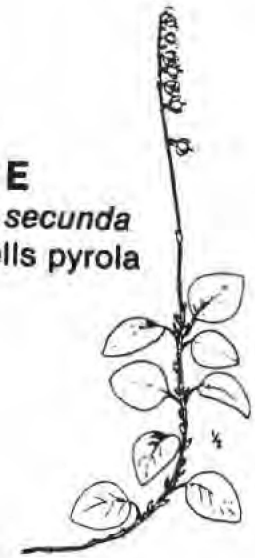
Dominants	Cov	Cons
ABAMM	8	100
PSMEM	26	100
ABAMR	18	67
THPLR	3	67
TSHER	3	67
.....		
VAAL	23	100
GASH	9	100
RHMA	12	100
VAPA	6	100
.....		
COCA	8	100
TROV	2	67

This association was sampled on adjacent areas of the Mt. Hood National Forest. It may occur at the north end of the Forest in the lower portion of the Pacific silver fir zone. This type indicates cool, dry sites with long growing seasons and poor soil nutrient status. Productivity appears to be fairly low. Heat damage to emergent seedlings and moisture stress in planted seedlings are the most common reforestation problems. Shade protection of seedlings is desirable on south-facing slopes. Douglas-fir and noble fir are both suitable for planting. Douglas-fir grows better on warmer sites. Shrub competition should not usually be a problem, but snowbrush may be a competitor on severely burned sites. Wildlife use is low.

	Site Index Douglas-fir	Site Index Noble fir	GBA DF	GBA NF	Basal Area sq ft/ac	Herbage lbs/ac
Mean	72	-	420	-	440	305
SE	9	-	39	-	56	21

Pacific silver fir / big huckleberry / beargrass
ABAM / VAME / XETE
CFS2 51

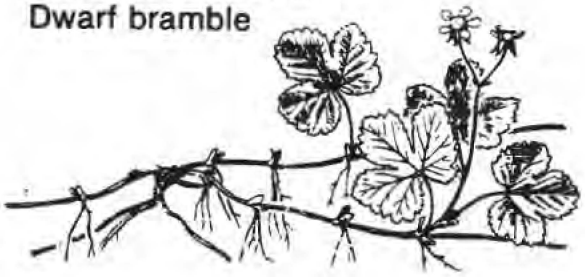
XETE
Xerophyllum tenax
Beargrass



PYSE
Pyrola secunda
Sidebells pyrola

VAME
Vaccinium membranaceum
Big huckleberry

RULA
Rubus lasiococcus
Dwarf bramble



Pacific silver fir / big huckleberry / beargrass
ABAM / VAME / XETE
CFS2 51

Elevation: 5000, 3600-5200
% Slope: 30, 4-65
Aspect: All.
Landform: Cold flats, benches and upper slopes.

Soils: Shallow to moderately deep, usually stony. Well-drained, often droughty.

Total soil depth: 43, 18-73
Effective depth: 28, 7-51

Dominants	Cov	Cons
ABAMM	28	96
PSMEM	22	67
ABAMR	22	100
.....		
VAME	16	96
.....		
XETE	37	92
CLUN	4	67
PYSE	5	54

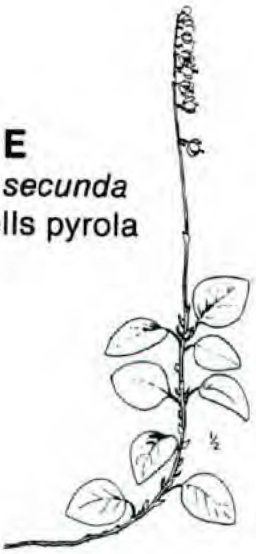
This is the most common plant association at upper elevations in the Pacific silver fir zone. It indicates well-drained soils, cool summers and long winters with deep snowpacks. Frost can occur at any time during the growing season. Tree growth rates are among the lowest in the Pacific silver fir zone. Frost, deep, persistent snowpacks, beargrass-sedge mats and pocket gopher damage often delay reforestation. Cold sub-surface soil temperatures (which inhibit root function) coupled with high evaporative demand on sunny days may cause moisture stress and slow growth. Noble fir and Pacific silver fir roots are better adapted than Douglas-fir roots to most sites. Beargrass-sedge mats may compete with seedlings and provide ideal pocket gopher feeding habitat. Pines and Engelmann spruce are least likely to suffer pocket gopher damage. Big game use this association for summer range. Huckleberry fields are common in early succession and may have been heavily used by aboriginal people.

	Site Index Douglas-fir	Site Index Noble fir	GBA DF	GBA NF	Basal Area sq ft/ac	Herbage lbs/ac
Mean	96	94	301	337	318	246
SE	1	1	3	6	8	15

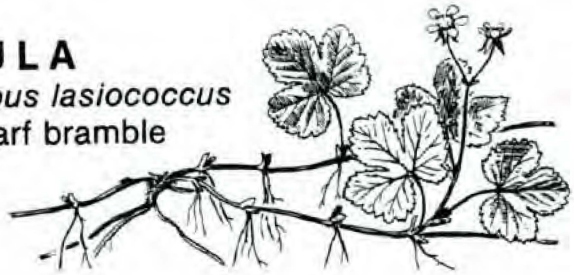
Pacific silver fir / big huckleberry / queencup beadlily
ABAM / VAME / CLUN
CFS2 56

VAME
Vaccinium membranaceum
Big huckleberry

PYSE
Pyrola secunda
Sidebells pyrola

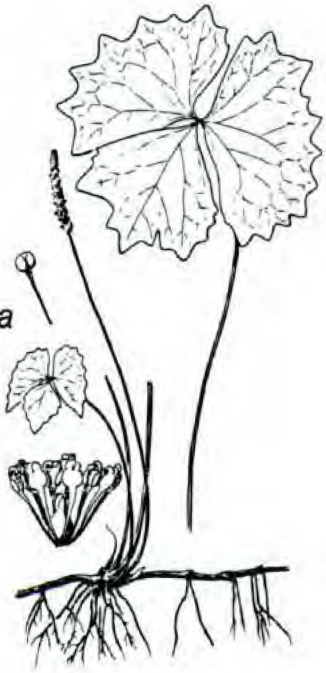


RULA
Rubus lasiococcus
Dwarf bramble



CLUN
Clintonia uniflora
Queencup beadlily

ACTR
Achlys triphylla
Vanilla leaf



Pacific silver fir / big huckleberry / queencup beadlily
ABAM / VAME / CLUN
CFS2 56

Elevation: 4531, 3500-5580
% Slope: 29, 5-58
Aspect: All.
Landform: Cool, moist flats and slopes.

Soils: Moderately shallow to deep, usually fine textured. Well drained but moist.
Total soil depth: 49, 21-72
Effective depth: 29, 12-65

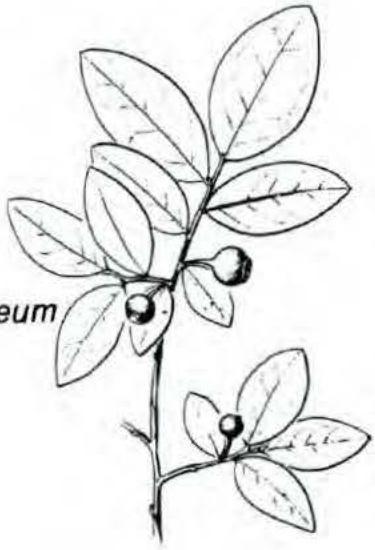
Dominants	Cov	Cons
ABAMM	25	100
PSMEM	25	73
ABAMR	18	100
.....		
VAME	18	100
CHUM	6	100
.....		
CLUN	8	91
PYSE	4	82
ACTR	8	77
TROV	2	73

This association indicates relatively cool, moist growing season conditions and long winters with deep snowpacks. The herb-rich understory reflects a moist environment and relatively high productivity. Noble fir site index is substantially higher than that of Douglas-fir. Many stands on moist, cool sites are dominated by rapidly growing Engelmann spruce. Frost resistant species should be planted on gentle slopes. As in other cold, high elevation associations, a significant portion of the soil nitrogen is in the duff and litter layers and could be lost during a hot slash burn. Soils may be moist and compactible through a good part of the summer. This association provides important deer and elk summer range, especially where the canopy is open and huckleberries are abundant. Huckleberry fields are common in early succession and may have been heavily used by aboriginal people.

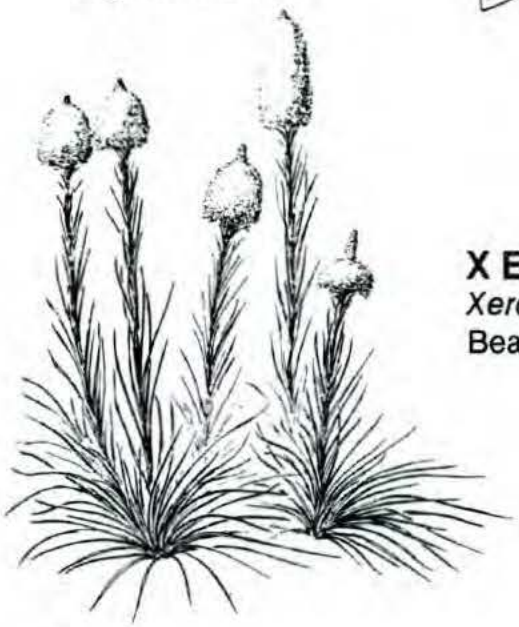
	Site Index Douglas-fir	Site Index Noble fir	GBA DF	GBA NF	Basal Area sq ft/ac	Herbage lbs/ac
Mean	112	126	254	453	298	225
SE	1	2	7	10	10	15

Pacific silver fir / Cascades azalea / beargrass
ABAM / RHAL / XETE
CFS5 51

RHAL
Rhododendron albiflorum
Cascades azalea

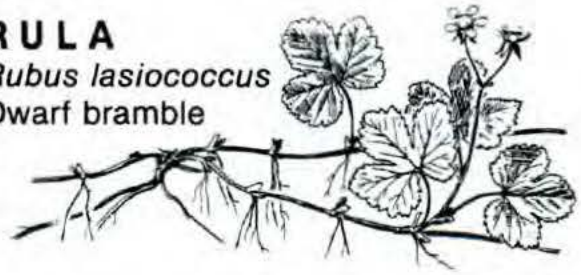


VAME
Vaccinium membranaceum
Big huckleberry



XETE
Xerophyllum tenax
Beargrass

CLUN
Clintonia uniflora
Queencup beadlily



RULA
Rubus lasiococcus
Dwarf bramble

Pacific silver fir / Cascades azalea / beargrass
ABAM / RHAL / XETE
CFS5 51

Elevation: 4650, 4600-4700
% Slope: 33, 15-50
Aspect: Northeast.
Landform: Cirques and cold benches.

Soils: Shallow and very stony. Developed in colluvium, glacial till, residuum or tephra.

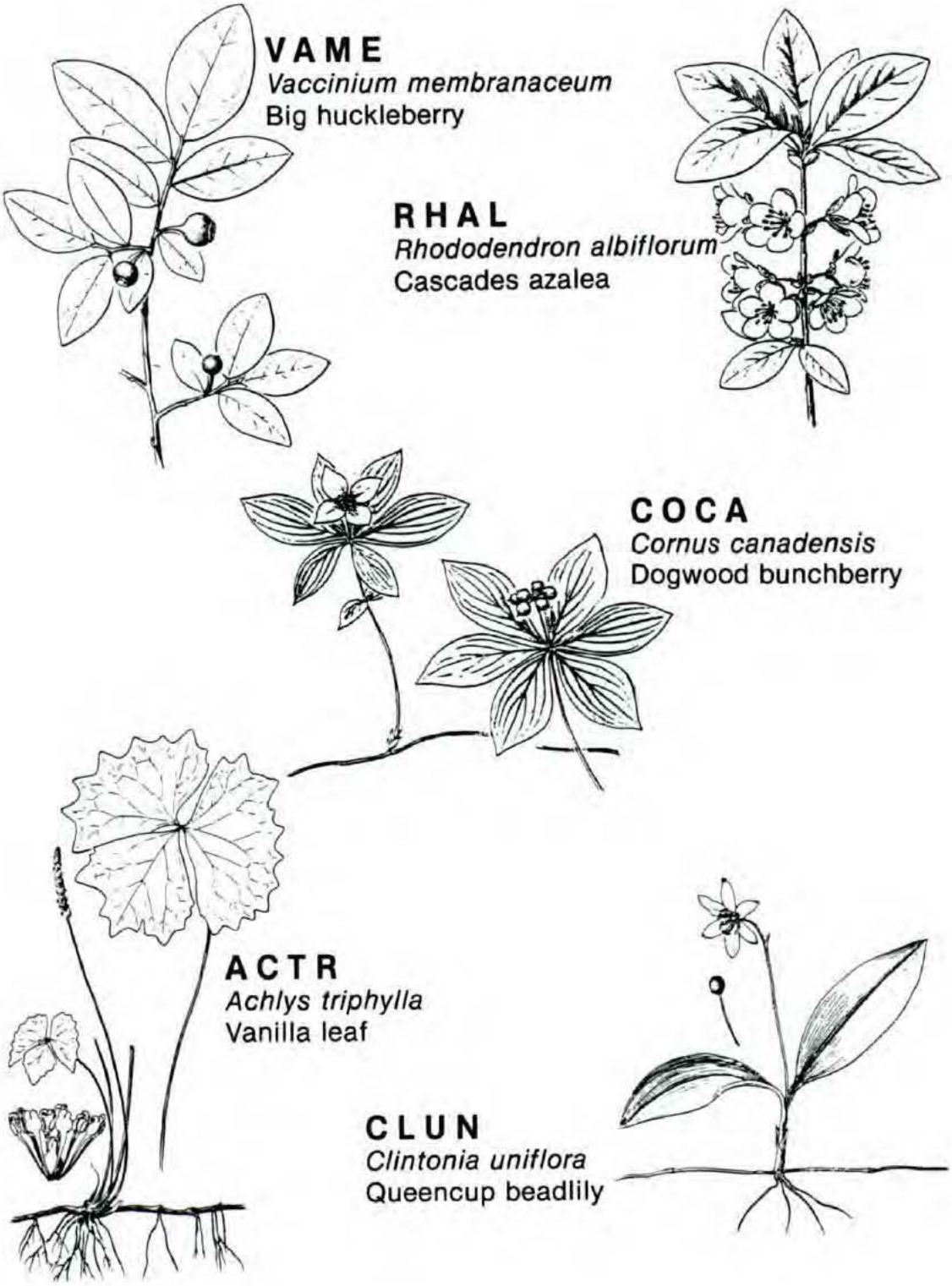
Total soil depth: 33, 22-44
Effective depth: 23, 17-29

Dominants	Cov	Cons
ABAMM	45	100
ABPRM	5	100
ABAMR	11	100
TSMER	4	100
.....		
RHAL	30	100
VAME	18	100
.....		
XETE	68	100
CLUN	5	100

This association indicates deep, late-melting snowpacks and cool summers. Frost can occur in openings any time during the growing season, particularly on gentle slopes and in frost pockets. These environmental conditions make regeneration difficult. Only frost resistant species should be planted. Productivity is low. Soils are likely to be moist and compactible well into the summer. Shallow, stony soils may be susceptible to nutrient loss with slash burning. Wildlife use is not common. Big game may find relief from summer heat on the cool, moist north slopes typical of this association. Forage amounts are low.

	Site Index Douglas-fir	Site Index Noble fir	GBA DF	GBA NF	Basal Area sq ft/ac	Herbage lbs/ac
Mean	73	-	282	-	303	262
SE	2	-	8	-	4	16

Pacific silver fir / Cascades azalea / queencup beadlily
ABAM / RHAL / CLUN
CFS5 52



VAME
Vaccinium membranaceum
Big huckleberry

RHAL
Rhododendron albiflorum
Cascades azalea

COCA
Cornus canadensis
Dogwood bunchberry

ACTR
Achlys triphylla
Vanilla leaf

CLUN
Clintonia uniflora
Queencup beadlily

Pacific silver fir/Cascades azalea/queencup beadlily
ABAM/RHAL/CLUN
CFS5 52

Elevation: 4160, 3500-4800
% Slope: 42, 24-78
Aspect: Northerly.
Landform: Upper slopes, cirques, benches and wet areas.

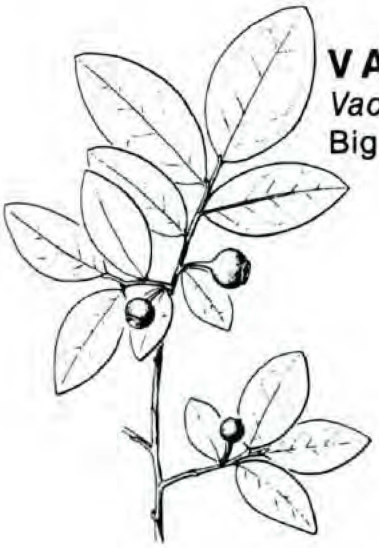
Soils: Moderately deep and stony. Wet or saturated most of the summer.
Total soil depth: 49, 21-72
Effective depth: 29, 12-65

Dominants	Cov	Cons
ABAMM	33	80
TSHEM	12	80
TSMEM	7	60
ABAMR	14	100
.....		
RHAL	17	100
VAME	24	100
.....		
CLUN	11	100
COCA	7	80
ACTR	3	60

This relatively rare plant association probably does not occur more than a short distance south of Santiam Pass. It indicates long, cold winters, deep snowpacks and short, frosty summers. Soil moisture is abundant. Both of the Cascades azalea associations produce low timber yields and are difficult to regenerate. Western white pine has the best height growth potential. Summer frost, deep winter snowpacks and, to a smaller degree, competing vegetation make regeneration difficult. Only frost resistant species should be planted. Moist, compactible, erodable soils will require careful falling and yarding. Shelterwood cuts will provide protection for seedlings and encourage natural regeneration. Due to herb richness, this association provides better forage than the Pacific silver fir/Cascades azalea/beargrass association. Both can be moderately important as big game summer range.

	Site Index Douglas-fir	Site Index Noble fir	GBA DF	GBA NF	Basal Area sq ft/ac	Herbage lbs/ac
Mean	112	126	254	453	298	273
SE	1	2	6	10	10	15

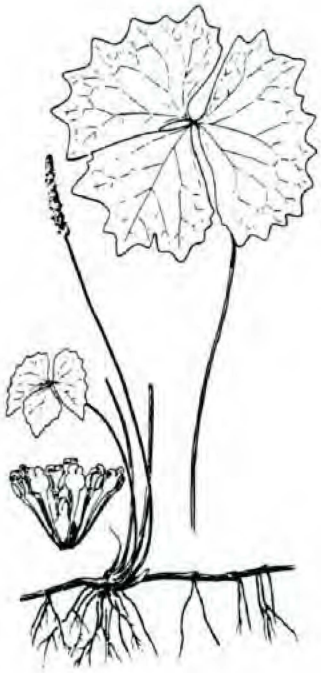
Pacific silver fir / coolwort foamflower
ABAM / TITR
CFF1 52



VAME
Vaccinium membranaceum
Big huckleberry

SMST
Smilacina stellata
False solomonseal

CLUN
Clintonia uniflora
Queencup beadlily



ACTR
Achlys triphylla
Vanilla leaf

TITR
Tiarella trifoliata
Coolwort foamflower

Pacific silver fir / coolwort foamflower
ABAM/TITR
CFF1 52

Elevation: 4397, 3000-5600
% Slope: 28, 1-68
Aspect: All.
Landform: Moist upper slopes and flats.

Soils: Deep, fine textured to moderately stony. Moist and well-drained.

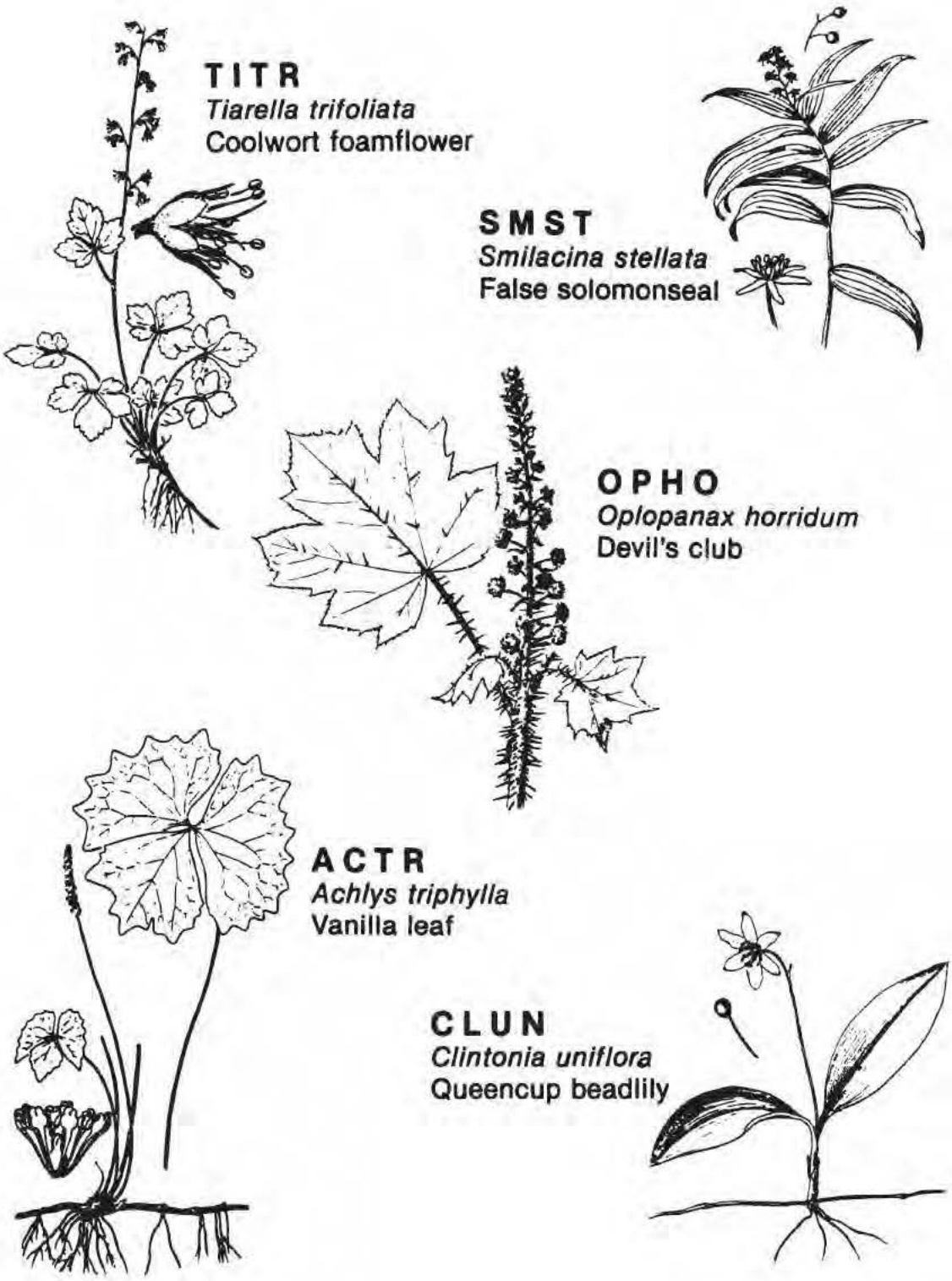
Total soil depth: 52, 19-96
Effective depth: 35, 5-86

Dominants	Cov	Cons
ABAMM	16	97
PSMEM	30	81
ABAMR	20	100
TSHER	8	64
.....		
VAME	8	78
CHUM	9	69
.....		
ACTR	14	97
TITR	10	88
SMST	8	86
CLUN	9	85
PYSE	4	66

This association occurs on moist, cool sites with relatively fertile soils. Snowpacks are not deep or persistent. The growing season is longer and warmer than that of many other Pacific silver fir zone associations. This association is one of the most productive and easily regenerated in the Pacific silver fir zone. Noble fir grows faster than Douglas-fir. Western white pine also grows well. Soils may be moist and compactible well into the summer. Big game use this association more than most others in the Pacific silver fir zone. Herbaceous forage is generally abundant. Many sites are adjacent to streams or meadows and provide valuable wildlife habitat.

	Site Index Douglas-fir	Site Index Noble fir	GBA DF	GBA NF	Basal Area sq ft/ac	Herbage lbs/ac
Mean	119	128	398	398	364	478
SE	1	1	6	9	5	11

Pacific silver fir / devil's club
ABAM / OPHO
CFS3 51



TITR
Tiarella trifoliata
Coolwort foamflower

SMST
Smilacina stellata
False solomonseal

OPHO
Oplopanax horridum
Devil's club

ACTR
Achlys triphylla
Vanilla leaf

CLUN
Clintonia uniflora
Queencup beadlily

Pacific silver fir/devil's club
ABAM/OPHO
CFS3 51

Elevation: 4095, 3300-5200
% Slope: 35, 0-75
Aspect: Northeast.
Landform: Lower slopes, benches, seeps and wet areas.
Soils: Deep, moderately stony, sand, silt or clay loams. Wet or saturated.
Total soil depth: 52, 24-68
Effective depth: 35, 8-65

Dominants	Cov	Cons
ABAMM	20	95
TSHEM	16	90
ABAMR	13	100
TSHER	9	76
.....		
OPHO	35	100
.....		
SMST	25	90
TITR	16	86
ACTR	14	86
CLUN	10	86

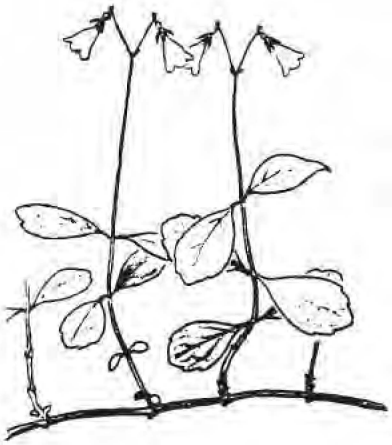
This association indicates wet sites, usually with impeded drainage or near streams. They are warmer and accumulate shallower snowpacks than the Pacific silver fir/Cascades azalea associations. Douglas-fir and noble fir grow well. Regeneration should not be difficult if seedlings are planted soon after harvest, giving them a chance to gain a height advantage over competing shrubs. However, this association presents some management challenges. Frost may be a problem in basins. High water tables may prevent establishment of Douglas-fir except on raised planting sites. Western redcedar may do well under these conditions. Soils are usually saturated through the summer. Harvest methods should emphasize reduction of soil disturbance and compaction. Wildlife and watershed values are high. Herbaceous forage is plentiful. Many natural stands are composed of old-growth Douglas-fir trees which are important as wildlife habitat.

	Site Index Douglas-fir	Site Index Noble fir	GBA DF	GBA NF	Basal Area sq ft/ac	Herbage lbs/ac
Mean	123	135	375	500	387	499
SE	2	2	7	11	11	25

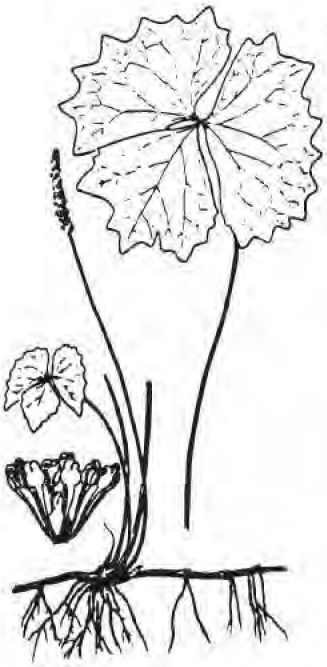
Pacific silver fir/dwarf Oregon grape
ABAM/BENE
CFS1 51

BENE
Berberis nervosa
Dwarf Oregon grape

CHUM
Chimaphila umbellata
Prince's pine

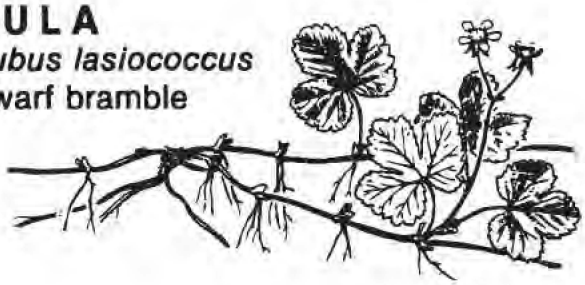


LIBO2
Linnaea borealis
Twinflower



ACTR
Achlys triphylla
Vanilla leaf

RULA
Rubus lasiococcus
Dwarf bramble



Pacific silver fir/dwarf Oregon grape
ABAM/BENE
CFS1 51

Elevation: 3737, 3000-4700
% Slope: 32, 5-72
Aspect: All.
Landform: Mid-slopes.

Soils: Shallow to deep,
moderately stony.
Well-drained.
occasionally droughty.

Total soil depth: 49, 15-95
Effective depth: 31, 6-54

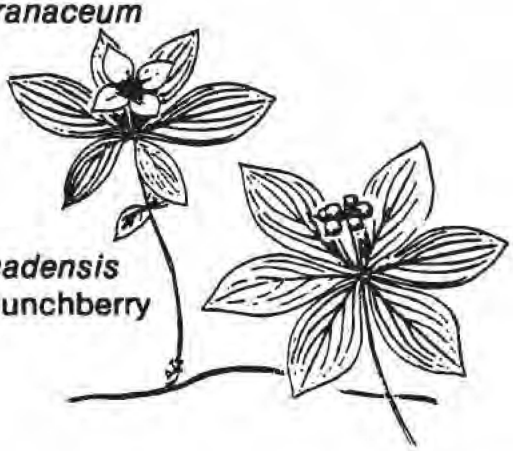
Dominants	Cov	Cons
PSMEM	29	100
TSHEM	20	97
ABAMM	15	83
ABAMR	14	93
TSHER	12	88
.....		
BENE	17	98
CHUM	10	88
.....		
XETE	8	100
ACTR	8	78
LIBO2	14	67
TROV	2	67

This association is found on warmer, well-drained, lower-elevation slopes in the Pacific silver fir zone. Growing seasons are long and frost free. Productivity is in the mid-range for Pacific silver fir zone plant associations. The warm climate and long growing season produce conditions favorable for regeneration. Exposed south-facing slopes with well-drained soils can be droughty and seedlings may require shading. Douglas-fir and noble fir are both suitable species for regeneration. Canopy removal and soil disturbance may encourage shrub development, especially snowbrush and vine maple. Elk use appears to be moderate while deer use is relatively high. Most use is likely to be for thermal cover, as forage is not abundant.

	Site Index Douglas-fir	Site Index Noble fir	GBA DF	GBA NF	Basal Area sq ft/ac	Herbage lbs/ac
Mean	104	76	296	303	287	230
SE	4	11	10	14	11	45

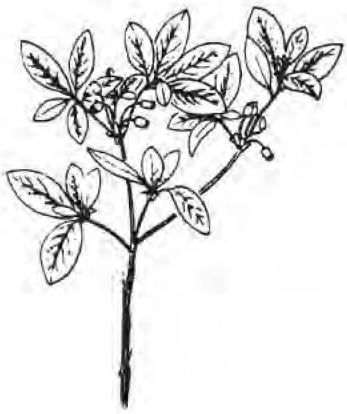
Pacific silver fir / fool's huckleberry
ABAM / MEFE
CFS2 54

VAME
Vaccinium membranaceum
Big huckleberry

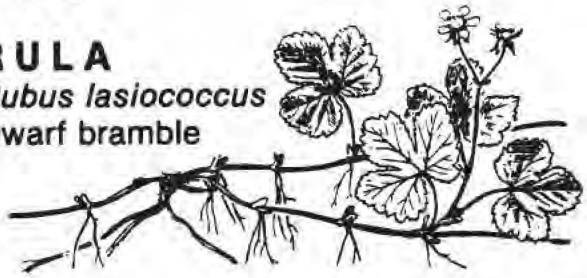


COCA
Cornus canadensis
Dogwood bunchberry

XETE
Xerophyllum tenax
Beargrass



MEFE
Menziesia ferruginea
Fool's huckleberry



RULA
Rubus lasiococcus
Dwarf bramble

Pacific silver fir / fool's huckleberry
ABAM / MEFE
CFS2 54

Elevation: 4000, 3300-4700
% Slope: 28, 5-85
Aspect: Northerly, (S).
Landform: Moist, cool upper slopes.

Soils: Moderately shallow and stony to very stony. Moist but usually well-drained.

Total soil depth: 37, 17-61
Effective depth: 24, 8-57

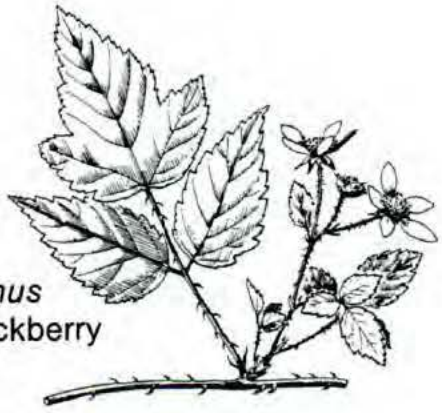
Dominants	Cov	Cons
ABAMM	31	89
TSHEM	14	89
ABAMR	15	89
TSHER	5	89
.....		
MEFE	22	89
VAME	21	89
.....		
XETE	17	89
COCA	10	78

Our samples of this association are from adjacent areas on the Mt. Hood National Forest. It may be expected to occur on upper elevation, high precipitation areas of the Detroit and Sweet Home Ranger Districts. Snowpacks are deep and long lasting. Productivity is among the lowest in the Pacific silver fir zone. Summer frost is the major obstacle to planted seedling survival. Frost tolerant species should be planted. Shelterwood cutting may be necessary to provide thermal protection, but blowdown of the overwood may be a problem on shallow soils. Herb biomass is low but light summer range use by deer and elk may occur.

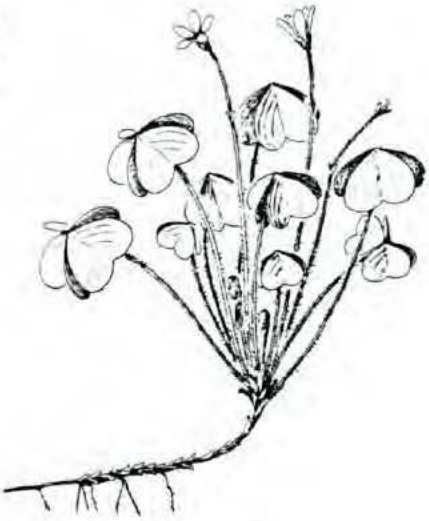
	Site Index Douglas-fir	Site Index Noble fir	GBA DF	GBA NF	Basal Area sq ft/ac	Herbage lbs/ac
Mean	73	-	292	-	303	242
SE	1	-	8	-	4	36

Pacific silver fir / Oregon oxalis
ABAM / OXOR
CFF1 53

SMST
Smilacina stellata
False solomonseal

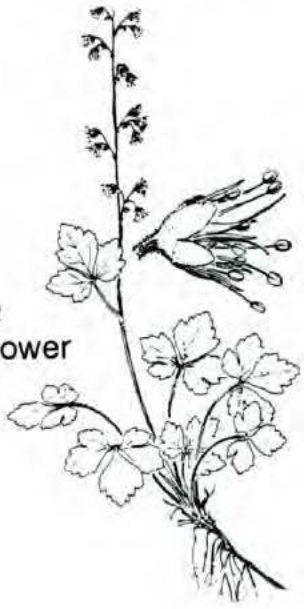


RUUR
Rubus ursinus
Trailing blackberry



OXOR
Oxalis oregana
Oregon oxalis

TROV
Trillium ovatum
Pacific trillium



TITR
Tiarella trifoliata
Coolwort foamflower

Pacific silver fir / Oregon oxalis
ABAM/OXOR
CFF1 53

Elevation: 4076, 3400-4600
% Slope: 42, 10-68
Aspect: All.
Landform: Benches, slopes and wet areas.

Soils: Deep, moderately stony. Moist but well drained. Parent material usually colluvium.
Total soil depth: 55, 18-96
Effective depth: 38, 11-77

Dominants	Cov	Cons
PSMEM	35	100
ABAMM	19	88
ABAMR	13	94
TSHER	6	94
.....		
RUUR	3	69
.....		
OXOR	38	100
TITR	5	88
TROV	2	82
SMST	7	76

This uncommon association indicates wet, relatively warm conditions which are more typical of the western hemlock zone. It is found on upper slopes in high precipitation areas at the north end of the Forest. Summer frosts are infrequent. Tree growth rates are among the highest in the Pacific silver fir zone. Competing vegetation should be the only major obstacle to successful regeneration. In some areas, cutting may raise the water table enough to reduce seedling survival. Western redcedar may be the best species to plant on these sites. Moist, compactible soils may require careful falling and yarding. Old-growth stands are common in this association and reflect the low natural fire history. Wildlife habitat values may be high in these stands. Herbaceous forage is abundant. Most stands are aesthetically pleasing and are good locations for trails.

	Site Index Douglas-fir	Site Index Noble fir	GBA DF	GBA NF	Basal Area sq ft/ac	Herbage lbs/ac
Mean	123	135	375	500	387	580
SE	2	2	7	11	12	77

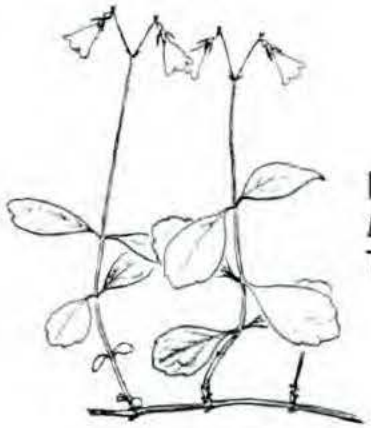
Pacific silver fir / rhododendron - Alaska huckleberry / dogwood bunchberry

ABAM / RHMA - VAAL / COCA

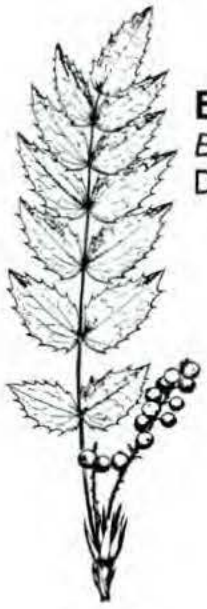
CFS6 54

VAAL
Vaccinium alaskaense
Alaska huckleberry

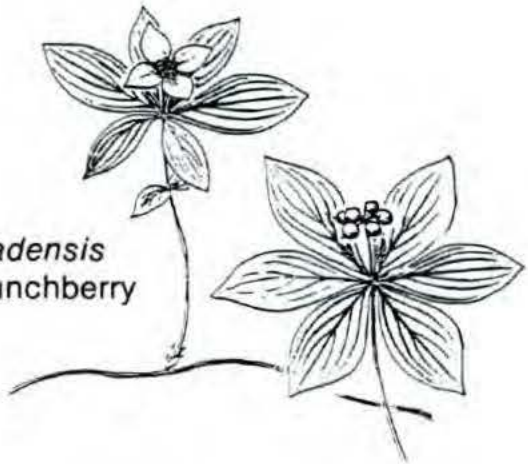
RHMA
Rhododendron macrophyllum
Rhododendron



LIBO2
Linnaea borealis
Twinflower



BENE
Berberis nervosa
Dwarf Oregon grape



COCA
Cornus canadensis
Dogwood bunchberry

Pacific silver fir / rhododendron - Alaska huckleberry / dogwood bunchberry

ABAM / RHMA - VAAL / COCA

CFS6 54

Elevation: 3900, 3300-4500
% Slope: 29, 5-55
Aspect: Northerly, (S).
Landform: Lower slopes, often near riparian areas.

Soils: Moderately deep, fine textured to stony. Well-drained and moist through early summer.

Total soil depth: 40, 16-60
Effective depth: 25, 6-48

Dominants	Cov	Cons
PSMEM	25	100
ABAMM	15	89
TSHEM	20	83
ABAMR	21	100
TSHER	5	61
.....		
RHMA	65	100
BENE	5	78
VAAL	16	72
RUUR	4	72
.....		
COCA	13	89
LIBO2	8	72
CLUN	8	67

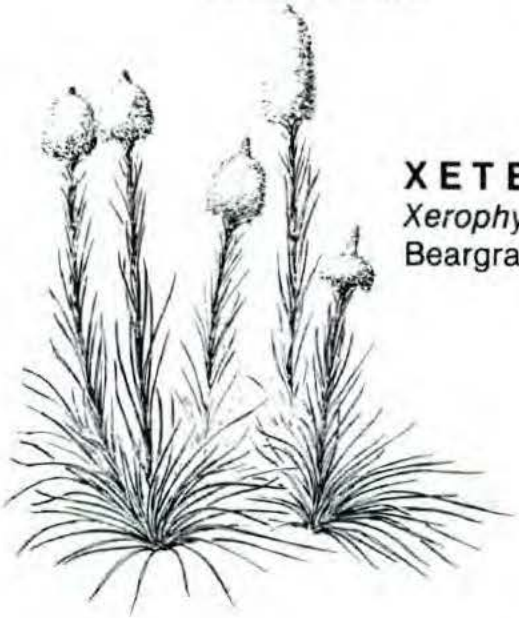
This uncommon plant association occurs most often on the Sweet Home and Detroit Ranger Districts. Productivity is lower than average for the Pacific silver fir zone. Douglas-fir and noble fir site indices are roughly equal. Since this association occurs on cool sites, Noble fir is more likely to survive than Douglas-fir. Western white pine will survive best in severe frost pockets. Moderate competition from shrubs such as rhododendron, huckleberries and vine maple can occur in clearcuts. Seedlings should be established as soon as possible after timber harvest. There may be low levels of available nitrogen on the most herb-poor sites. Fires that consume the duff may have a negative impact on the productivity of these sites. Big game use appears to be low. Thick rhododendron can provide good hiding cover.

	Site Index Douglas-fir	Site Index Noble fir	GBA DF	GBA NF	Basal Area sq ft/ac	Herbage lbs/ac
Mean	97	95	347	361	318	236
SE	1	1	9	12	7	12

Pacific silver fir / rhododendron / beargrass
ABAM / RHMA / XETE
CFS6 53

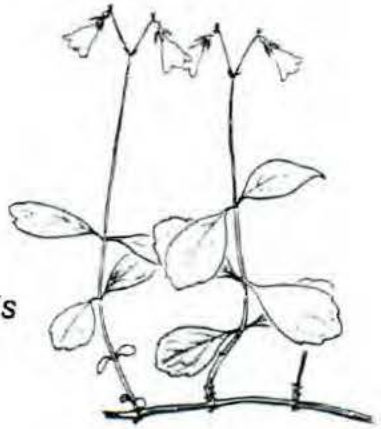
VAME
Vaccinium membranaceum
Big huckleberry

RHMA
Rhododendron macrophyllum
Rhododendron



XETE
Xerophyllum tenax
Beargrass

BENE
Berberis nervosa
Dwarf Oregon grape



LIBO2
Linnaea borealis
Twinflower

Pacific silver fir / rhododendron / beargrass
ABAM / RHMA / XETE
CFS6 53

Elevation: 4030, 3100-5100
% Slope: 32, 10-69
Aspect: Northwest, all.
Landform: Dry mid- to upper slopes.

Soils: Shallow to moderately deep, often stony. Well drained.

Total soil depth: 46, 8-118
Effective depth: 30, 3-99

Dominants	Cov	Cons
TSHEM	22	88
ABAMM	16	43
ABAMR	15	96
TSHER	6	73
.....		
RHMA	53	100
VAME	8	69
BENE	7	60
.....		
XETE	23	100
LIBO2	7	58

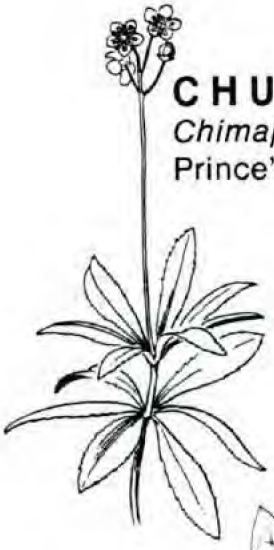
This association indicates a dry, cool environment. Tree canopies often appear chlorotic, indicating low levels of available nitrogen in the soil. Snowpacks are persistent, growing season conditions relatively dry and frost may occur at any time of the year. As in other rhododendron dominated plant associations, productivity is relatively low. Regeneration may be limited by drought and frost. Frost pockets are liable to occur wherever cold air accumulates. Drought becomes a problem where late snowmelt delays planting until late spring or early summer. If seedlings are not established quickly, shrub competition may become severe. The duff layer contains most of the available nitrogen and should be conserved. Big game use is generally limited to travel corridors.

	Site Index Douglas-fir	Site Index Noble fir	GBA DF	GBA NF	Basal Area sq ft/ac	Herbage lbs/ac
Mean	96	96	341	501	332	222
SE	2	3	7	13	9	12

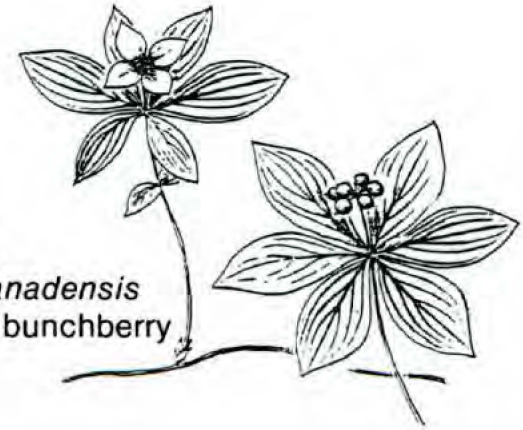
Pacific silver fir / rhododendron - dwarf Oregon grape

ABAM / RHMA - BENE

CFS6 52

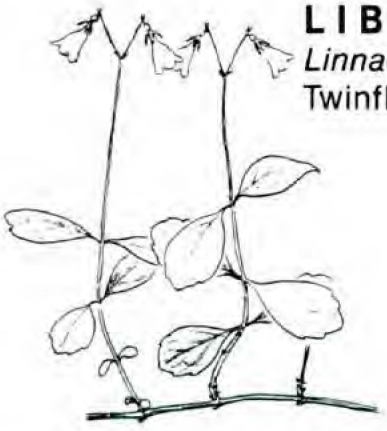


CHUM
Chimaphila umbellata
Prince's pine



COCA
Cornus canadensis
Dogwood bunchberry

RHMA
Rhododendron macrophyllum
Rhododendron



LIBO2
Linnaea borealis
Twinflower

BENE
Berberis nervosa
Dwarf Oregon grape

Pacific silver fir / rhododendron - dwarf Oregon grape
ABAM/RHMA - BENE
CFS6 52

Elevation: 4117, 3300-5300
% Slope: 27, 5-65
Aspect: Northeast, (all).
Landform: Mid-slopes.

Soils: Shallow to moderately deep, usually stony. Well-drained droughty.

Total soil depth: 46, 30-70
Effective depth: 28, 17-55

Dominants	Cov	Cons
PSMEM	31	100
TSHEM	21	83
ABAMM	12	75
ABAMR	9	100
TSHER	9	58
.....		
RHMA	62	100
BENE	10	92
CHUM	5	83
VAME	3	50
.....		
COCA	6	42

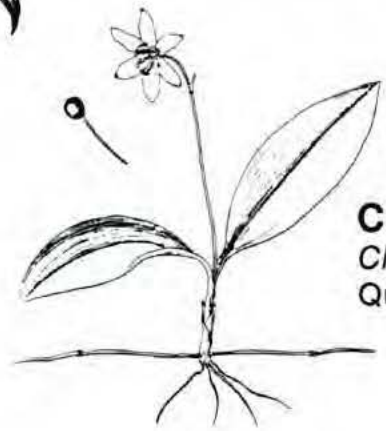
This association indicates a relatively warm and dry environment. Snow accumulates during the winter but melts early on most sites. Productivity is moderate for the Pacific silver fir zone. Douglas-fir appears to grow faster than noble fir. Douglas-fir site index is lower on sites that lack deciduous shrubs and herbs. The growing season is relatively long and warm. Summer drought may develop on many sites. Shading and early planting should improve seedling survival. Douglas-fir is the most appropriate species on droughty slopes. Shrub competition (snowbrush, vine maple and rhododendron) can develop on severely disturbed sites. Soils may be sensitive to moderately hot slash fires. Big game use is concentrated in openings where palatable species are more abundant.

	Site Index Douglas-fir	Site Index Noble fir	GBA DF	GBA NF	Basal Area sq ft/ac	Herbage lbs/ac
Mean	104	76	341	501	287	109
SE	2	4	7	13	6	33

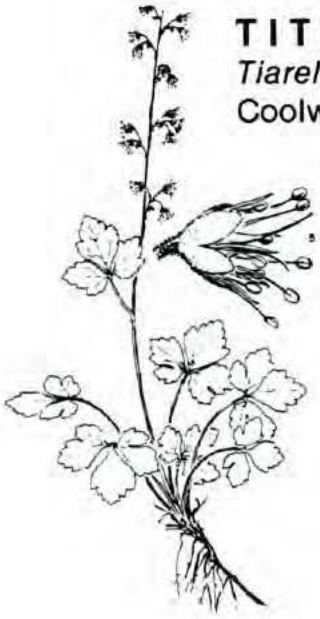
Pacific silver fir / vine maple / coolwort foamflower
ABAM / ACCI / TITR
CFS6 51

S M S T
Smilacina stellata
False solomonseal

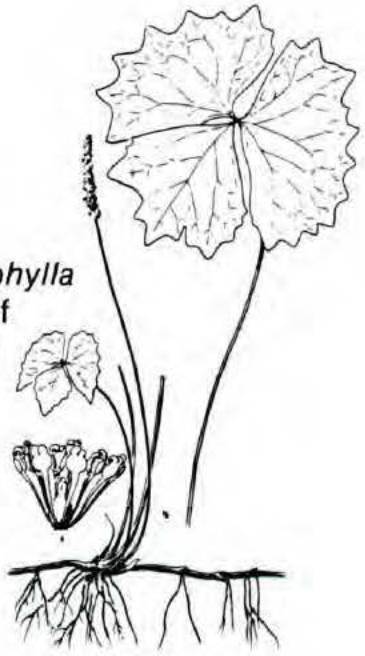
A C C I
Acer circinatum
Vine maple



C L U N
Clintonia uniflora
Queencup beadlily



T I T R
Tiarella trifoliata
Coolwort foamflower



A C T R
Achlys triphylla
Vanilla leaf

Pacific silver fir/vine maple/coolwort foamflower
ABAM/ACCI/TITR
CFS6 51

Elevation: 4276, 3300-6100
% Slope: 34, 10-72
Aspect: Southerly.
Landform: Moist, warm slopes and flats.

Soils: Deep, fine textured to moderately stony. Moist through mid-summer, well-drained.

Total soil depth: 50, 12-70
Effective depth: 33, 5-31

Dominants	Cov	Cons
ABAMM	13	100
PSMEM	35	95
ABAMR	9	95
TSHER	6	62
.....		
ACCI	31	95
CHUM	10	76
VAME	7	71
.....		
ACTR	15	90
TITR	12	86
ASCA3	6	86
SMST	18	81

This association indicates well-watered, well-drained, relatively warm, productive sites. Summer frost may occur in depressions and flat areas. Productivity values are the highest of the Pacific silver fir series. Douglas-fir, noble fir and western white pine all grow well. High soil surface temperatures may damage emergent seedlings on steep, south-facing, rocky slopes. Shade may increase survival of planted seedlings on these sites. Shrub competition from snowbrush, vine maple, huckleberries and rhododendron may develop within 3 to 4 years following stand opening. A lush herb layer in early successional stages provides excellent pocket gopher habitat. Soils may be moist and compactible through the summer. Big game use is often high. Forage is abundant

	Site Index Douglas-fir	Site Index Noble fir	GBA DF	GBA NF	Basal Area sq ft/ac	Herbage lbs/ac
Mean	133	140	452	505	347	478
SE	2	2	14	17	13	39

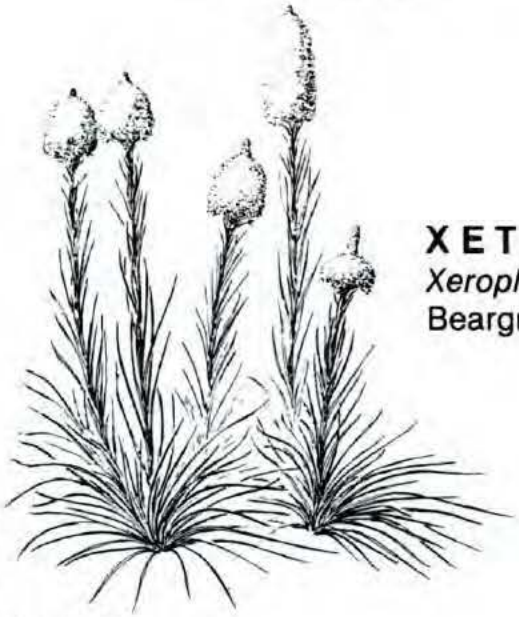
Pacific silver fir - western hemlock / rhododendron - salal

ABAM - TSHE / RHMA - GASH

CFC2 51

G A S H
Gaultheria shallon
Salal

R H M A
Rhododendron macrophyllum
Rhododendron



X E T E
Xerophyllum tenax
Beargrass

B E N E
Berberis nervosa
Dwarf Oregon grape

V A O V
Vaccinium ovalifolium
Oval-leaf huckleberry

Pacific silver fir - western hemlock / rhododendron - salal
ABAM - TSHE / RHMA - GASH
CFC2 51

Elevation: 3500, 300-4100
% Slope: 44, 18-60
Aspect: Southwest, Northwest
Landform: Dry mid-slopes.

Soils: Shallow to moderately deep. Stony or very stony. Well-drained and dry.

Total soil depth: 43, 18-60
Effective depth: 18, 5-31

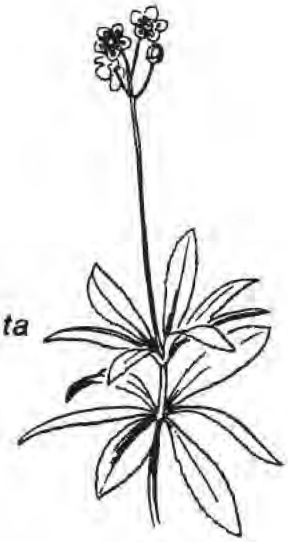
Dominants	Cov	Cons
PSMEM	29	100
TSHEM	23	100
ABAMM	16	80
ABAMR	6	100
TSHER	8	80
.....		
RHMA	62	100
GASH	30	100
BENE	23	60
VAOV	4	60
.....		
XETE	7	60

This association was sampled on adjacent areas of the Mt. Hood National Forest. It occasionally occurs on warm, dry sites at the north end of the Forest. Summers are warm and dry without growing season frosts. Winter snowpacks are neither deep nor long-lasting. Nitrogen may be limiting especially in stands lacking an herb layer. As in other associations dominated by rhododendron, tree growth is often slow, possibly limited by low nitrogen availability. Growth of western white pine may exceed that of both Douglas-fir and noble fir on nutrient-poor sites. Drought may contribute to seedling mortality and shading may be essential. Shrub competition may be intense. Care should be taken to preserve the duff and topsoil. This association is not heavily used by wildlife.

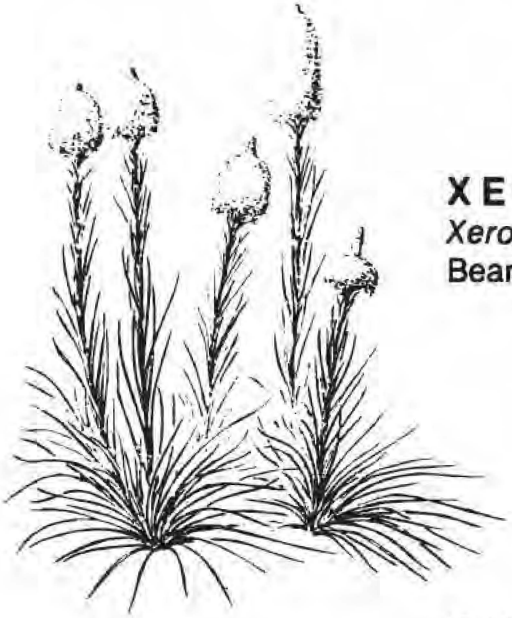
	Site Index Douglas-fir	Site Index Noble fir	GBA DF	GBA NF	Basal Area sq ft/ac	Herbage lbs/ac
Mean	101	-	276	-	296	175
SE	6	-	19	-	22	21

Mountain hemlock / big huckleberry / beargrass
TSME / VAME / XETE
CMS2 16

VAME
Vaccinium membranaceum
Big huckleberry

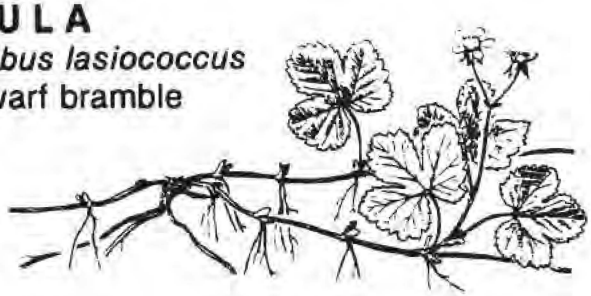


CHUM
Chimaphila umbellata
Prince's pine



XETE
Xerophyllum tenax
Beargrass

RULA
Rubus lasiococcus
Dwarf bramble



Mountain hemlock / big huckleberry / beargrass
TSME / VAME / XETE
CMS2 16

Elevation: 4694, 2500-5600
% Slope: 14, 5-33
Aspect: Southwest, (All).
Landform: High elevation flats, upper slopes.

Soils: Shallow to moderately deep, occasionally very stony. Well-drained & cold.

Total soil depth: 47, 16-98
Effective depth: 29, 5-69

Dominants	Cov	Cons
TSMEM	51	98
ABAMM	14	76
ABAMR	14	93
TSMER	9	76
.....		
VAME	21	100
CHUM	3	33
.....		
XETE	88	45

This association occurs in some of the harshest forested environments west of the Cascade Crest. Summers are short, cool and dry. Most sites are subject to frequent summer frosts. Snowpacks are deep and long-lasting. Tree growth is slow and reforestation difficult. Seedling survival is limited by cold sub-surface soil temperatures and high soil surface temperatures immediately following snowmelt, rapid soil drying, beargrass-sedge mats, pocket gophers, and a short growing season with frequent summer frost. Careful species selection is essential. Advanced regeneration should be conserved wherever possible. Moderately hot fires can deplete soil nitrogen. Big game summer use is significant where huckleberries are abundant. Forage levels are moderately high. Huckleberry fields, common in early succession may have been used by aboriginal people.

	Site Index Douglas-fir	Site Index Noble fir	GBA DF	GBA NF	Basal Area sq ft/ac	Herbage lbs/ac
Mean	95	71	312	351	295	309
SE	3	1	4	3	5	13

Mountain hemlock / grouse huckleberry
TSME / VASC
CMS1 14

VASC
Vaccinium scoparium
Grouse huckleberry

VAME
Vaccinium membranaceum
Big huckleberry

XETE
Xerophyllum tenax
Beargrass

CHUM
Chimaphila umbellata
Prince's pine

Mountain hemlock / grouse huckleberry
TSME / VASC
CMS1 14

Elevation: 5247, 5000-5700
% Slope: 13, 0-34
Aspect: Northwest, Southeast.
Landform: High elevation flats and upper slopes.

Soils: Shallow to moderately deep and rocky. Well drained and cold.

Total soil depth: 42, 26-60
Effective depth: 29, 9-51

Dominants	Cov	Cons
TSMEM	64	100
ABAMM	14	53
TSMER	5	81
.....		
VASC	29	100
CHUM	3	39
VAME	18	36
.....		
XETE	17	17

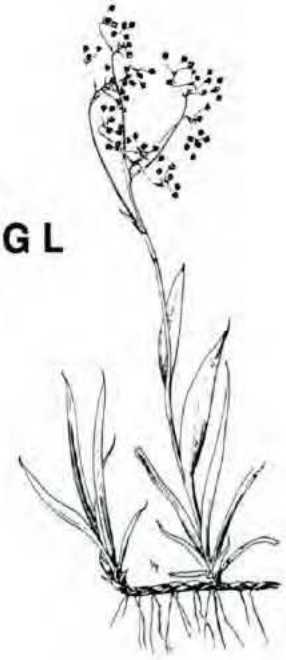
This association occurs on very cold sites with well-drained soils. Snowpacks are deep and persistent. Summers are short with frequent frost. Slopes are usually gentle, accentuating cold air accumulation and summer frost. This association usually occurs on the high Cascade plateau where moderately deep soils have developed from volcanic tephra, often over glacial till. Most sites are difficult to manage for timber. Productivity and conifer height growth rates are low. Cold adapted species such as western white pine and mountain hemlock grow as well as, and survive better than, Douglas-fir and noble fir. Frequent, severe summer frost, beargrass-sedge mats, pocket gopher damage and deep snowpacks make regeneration difficult. Care should be taken to preserve the duff and litter layers. Recreational values are often high. Big game summer use can be extensive if forage is available.

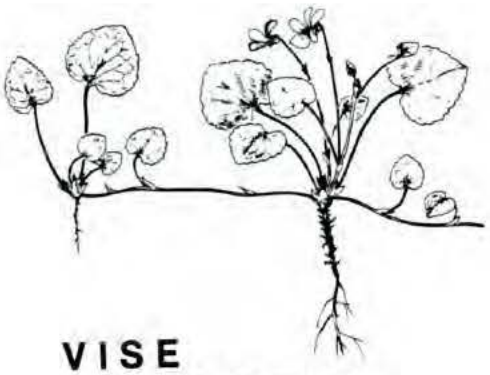
	Site Index Douglas-fir	Site Index Noble fir	GBA DF	GBA NF	Basal Area sq ft/ac	Herbage lbs/ac
Mean	70	70	184	465	234	235
SE	-	-	-	-	13	24

Mountain hemlock / luzula
TSME / LUZULA
CMG2 11

VAME
Vaccinium membranaceum
Big huckleberry

LUZULA SPP.
(*Luzula glabrata* **LUGL**
used for example)





VISE
Viola sempervirens
Redwoods violet

PERA
Pedicularis racemosa
Sickletop pedicularis

Mountain hemlock/luzula
TSME/LUZULA
CMG2 11

Elevation: 6355, 5500-6680
% Slope: 34, 12-58
Aspect: Northeast, Northwest.
Landform: High elevation flats.

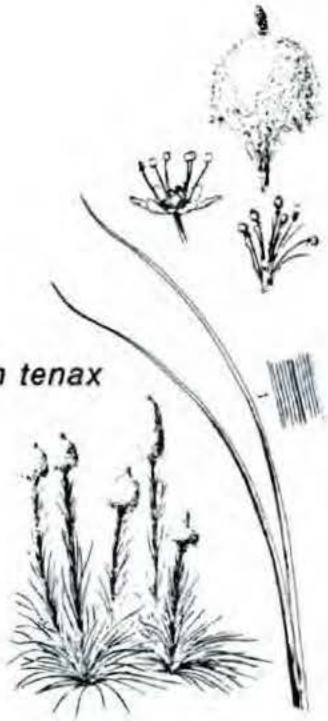
Soils: Coarse ash with little duff and low nitrogen levels.

Dominants	Cov	Cons
TSMEM	74	100
ABAMM	12	77
ABAMR	5	83
TSMER	2	83
.....		
VAME	44	33
.....		
LUZULA	14	100
PERA	1	33
VISE	1	33

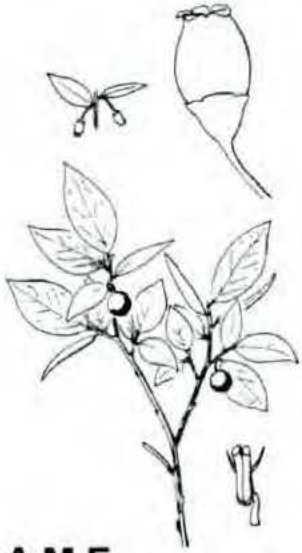
This association indicates a cold climate with deep snowpacks and short summers. Growing season frost can occur at any time on flat topography. Tree growth rates are similar to those of the mountain hemlock/grouse huckleberry association. Western white pine and lodgepole pine are the most rapidly growing and frost tolerant species. Frequent summer frost, persistent snowpacks, pocket gopher damage and competition from sedge mats make regeneration difficult. Soils are likely to be adversely affected by moderately hot slash fires. Fires will also destroy advanced regeneration mountain hemlock and Pacific silver fir seedlings which are the most reliable source of regeneration in harvested areas. Wildlife use does not appear to be high. This type may provide cover during big game migration to subalpine meadows in summer. It is common in many heavily used recreation areas, especially near Waldo Lake and in portions of the Three Sisters Wilderness.

Mountain hemlock / rhododendron
TSME / RHMA
CMS6 12

RHMA
Rhododendron macrophyllum
Rhododendron



XETE
Xerophyllum tenax
Beargrass



VAME
Vaccinium membranaceum
Big huckleberry

GAOV
Gaultheria ovatifolia
Wintergreen

Mountain hemlock / rhododendron
TSME / RHMA
CMS6 12

Elevation: 4271, 3100-5300
% Slope: 34, 2-90
Aspect: Westerly, (All).
Landform: Gentle to moderately steep cirque basins or ridges.

Soils: Shallow and stony or skeletal, often derived from glacial till.

Total soil depth: 40, 9-82
Effective depth: 24, 5-65

Dominants	Cov	Cons
TSMEM	22	95
PSMEM	21	82
ABAMM	12	77
ABAMR	19	82
TSMER	8	77
.....		
RHMA	63	100
VAME	8	77
.....		
XETE	35	95
LIBO2	5	27

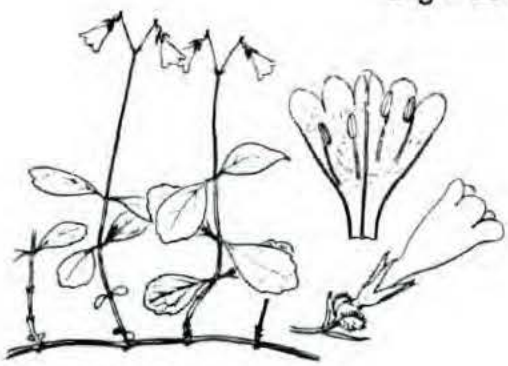
This association occurs at lower elevations in the mountain hemlock zone. Snowpacks are deep and persistent. Frost may occur at any time during the summer. Tree growth rates are comparable to those of the mountain hemlock/big huckleberry/beargrass association. Stands are often in poor condition, with broken topped and stunted trees. Soil nutrient levels are low. Regeneration is likely to be difficult due to short, cold summers and frequent summer frost. Stony soils may hinder planting. Shelterwood harvest should be considered where blowdown will not be a problem. Soils are likely to be adversely effected by slash fires. Moderately hot fire could volatilize most of the available nitrogen. Snowbrush may develop on some sites. Wildlife use is minimal, but some use for thermal cover during summer may occur.

	Site Index Douglas-fir	Site Index Noble fir	Basal Area sq ft/ac
Mean	91	-	245
SE	1	-	4

Western hemlock / Alaska huckleberry / dogwood bunchberry
TSHE / VAAL / COCA
CHS6 15

VAAL
Vaccinium alaskaense
Alaska huckleberry

VAME
Vaccinium membranaceum
Big huckleberry



LIBO2
Linnaea borealis
Twinflower

TITR
Tiarella trifoliata
Coolwort foamflower

COCA
Cornus canadensis
Dogwood bunchberry

Western hemlock / Alaska huckleberry / dogwood bunchberry
TSHE / VAAL / COCA
CHS6 15

Elevation: 2808, 1780-3900
% Slope: 22, 1-65
Aspect: All.
Landform: Flat sites above 3000 feet elevation, often near streams.

Soils: Moderately deep without abundant rocks. SRI unit 15 is most common.

Total soil depth: 38, 29-60
Effective depth: 31, 23-36

Dominants	Cov	Cons
TSHEM	46	100
PSMEM	41	100
TSHER	10	85
.....		
ACCI	19	85
BENE	9	85
VAAL	1	62
.....		
LIBO2	16	100
TITR	4	92
COCA	7	85
POMU	6	69
ACTR	5	62
VISE	3	62

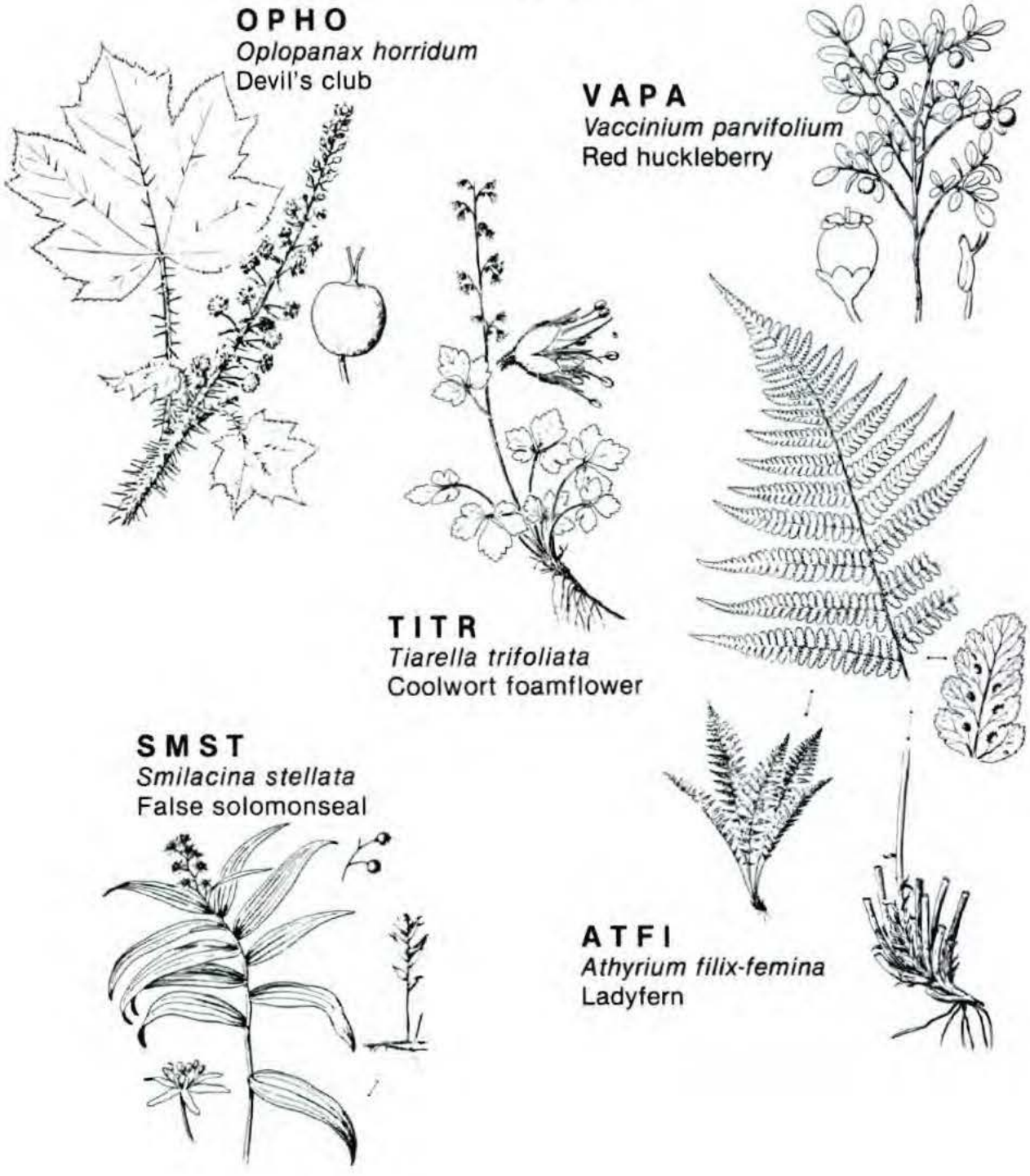
This relatively uncommon association occurs most often at the north end of the Forest. It intergrades strongly into the Pacific silver fir series. Summers are cooler than other western hemlock associations. Summer drought is usually mild. Winters are fairly severe with substantial snow accumulations. Occasional summer frost may occur on flat sites or in frost pockets. Douglas-fir growth is moderately good. Noble fir grows well on cooler sites. Regeneration can be hampered by summer frost, but Douglas-fir seedlings should survive and grow well. Soils are deep and fertile. Moderate slash burns should not cause unacceptable nutrient loss. Big game often use this association for thermal cover in summer. Herbaceous forage is abundant.

	Site Index Douglas-fir	Basal Area sq ft/ac	Herbage lbs/ac	Vine Maple	Salal	Rhodo-dendron	Dwarf Oregon Grape
				forage lbs/ac			
Mean	137	478	490	9	-	-	9
SE	1	12	112	6	-	-	6

Western hemlock / devil's club

TSHE / OPHO — WILL

CHS5 11



Western hemlock/devil's club
TSHE/OPHO — WILL
CHS5 11

Elevation: 2688, 1500-3780
% Slope: 18, 0-45
Aspect: Northerly.
Landform : Seeps and wet areas, often flat.

Soils: Shallow and usually rocky. SRI units 15 and 25 are most common.

Total soil depth: 35, 21-58
Effective depth: 29, 21-43

Dominants	Cov	Cons
TSHEM	32	100
PSMEM	29	92
TSHER	4	100
.....		
OPHO	28	100
WHMO	2	85
ACCI	36	69
RUSP	2	54
TITR	15	100
ATFI	10	85
POMU	8	85
TROV	1	85
SMST	6	77

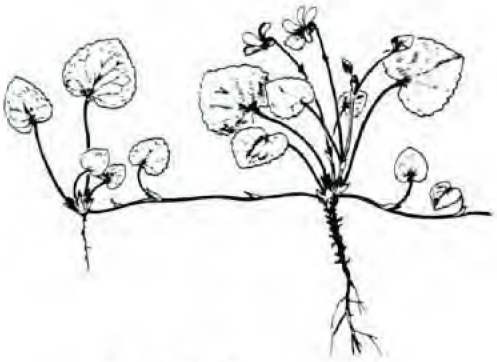
This association occurs in isolated wet spots. It represents a combination of abundant water and impeded drainage. It is most common in high rainfall areas, especially at upper elevations. Many sites are transitional to the Pacific silver fir series. This type rarely extends over more than a portion of an acre and is often distributed as stringers along drainages or seeps. Skunk cabbage indicates areas of organic or anaerobic soils. Special management to avoid unacceptable impacts may be necessary. Soils are wet and prone to compaction and water quality can be easily impacted. The abundant herbaceous forage and thermal cover provide excellent habitat for wildlife.

	Site Index Douglas-fir	Basal Area sq ft/ac	Herbage lbs/ac	Vine Maple forage	Salal forage	Rhodo-dendron lbs/ac	Dwarf Oregon Grape lbs/ac
Mean	168	308	1106	52	3	-	-
SE	1	26	295	30	3	-	-

Western hemlock / dwarf Oregon grape
TSHE / BENE
CHS1 25

BENE
Berberis nervosa
Dwarf Oregon grape

ACCI
Acer circinatum
Vine maple



VISE
Viola sempervirens
Redwoods violet

POMU
Polystichum munitum
Swordfern

Western hemlock / dwarf Oregon grape
TSHE/BENE
CHS1 25

Elevation: 2563, 1100-4100
% Slope: 40, 0-90
Aspect: Southwest, (All).
Landform: Well-drained sites throughout the western hemlock zone.

Soils: Moderately deep, sometimes clay soils. SRI types 15, 16, 23 are most common.

Total soil depth: 43, 5-60
Effective depth: 34, 5-58

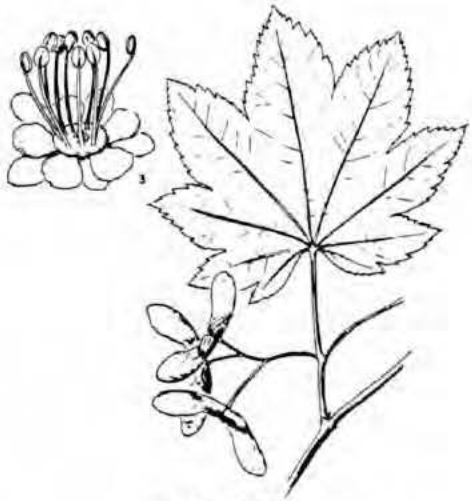
Dominants	Cov	Cons
PSMEM	52	99
TSHEM	33	88
TSHER	7	89
THPLR	5	47
.....		
BENE	31	100
ACCI	23	77
RUUR	1	72
VAPA	3	69
.....		
POMU	11	82
VISE	4	82
LIBO2	9	74
TROV	1	63

This association occurs across the Forest on warm, well-drained, moderately productive sites. Moderate site conditions and competition levels should allow relatively easy Douglas-fir regeneration with few silvicultural restrictions. Vine maple or Ceanothus spp. can present competition problems if seedlings are not established quickly. Ceanothus spp. are often a competition problem on south aspects or on severely burned sites. Tree growth is relatively good. Soils are generally deep and fertile enough to be resilient to moderately hot slash fires. Soils other than deep clays, are well drained and not usually susceptible to compaction. Some sites have responded well to fertilization. Big game use for winter range occurs on some sites.

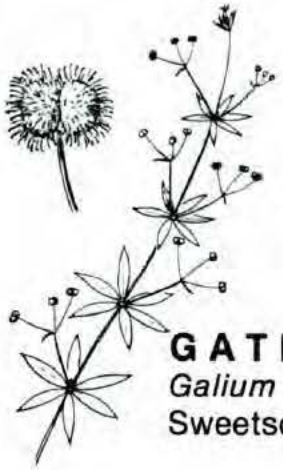
	Site Index Douglas-fir	Basal Area sq ft/ac	Herbage lbs/ac	Vine Maple forage	Salal forage	Rhodo-dendron lbs/ac	Dwarf Oregon Grape lbs/ac
Mean	139	346	219	16	9	1	63
SE	1	16	62	6	5	1	18

Western hemlock / dwarf Oregon grape / Oregon oxalis
TSHE / BENE / OXOR
CHS1 13

BENE
Berberis nervosa
Dwarf Oregon grape



ACCI
Acer circinatum
Vine maple



GATR
Galium triflorum
Sweetscented bedstraw

POMU
Polystichum munitum
Swordfern

OXOR
Oxalis oregana
Oregon oxalis

Western hemlock/dwarf Oregon grape/Oregon oxalis
TSHE/BENE/OXOR
CHS1 13

Elevation: 2344, 1360-3900
% Slope: 36, 0-83
Aspect: Northerly, (All).
Landform: Gentle, north-facing flats below 3000 feet elevation.

Soils: Deep, well-drained and well watered. SRI units 23, 15, 23, and 35 are most common.

Total soil depth: 49, 30-70
Effective depth: 42, 6-66

Dominants	Cov	Cons
PSMEM	20	100
TSHEM	23	96
THPLM	14	62
TSHER	11	89
THPLR	7	38
.....		
BENE	17	100
ACCI	22	85
VAOV	2	83
GASH	13	76
.....		
OXOR	20	100
POMU	17	100
VISE	4	64

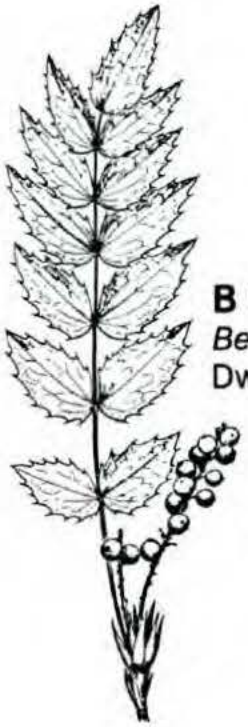
Moisture is more abundant than on typical western hemlock/dwarf Oregon grape sites. Growing seasons are long and relatively drought free. Regeneration should not be difficult. Competition from vine maple and other species should be moderate. Many sites will have moist soils well into the growing season. Care should be taken to minimize compaction. Tree growth rates are high. Soils should be more resistant to fire effects that most others in the western hemlock zone. Limited big game winter range use occurs. Summer use by big game may be more important. Thermal cover and evidence of big game were abundant in our sample stands of this association.

	Site Index Douglas-fir	Basal Area sq ft/ac	Herbage lbs/ac	Vine Maple forage	Salal forage	Rhodo-dendron lbs/ac	Dwarf Oregon Grape lbs/ac
Mean	159	433	647	17	14	26	130
SE	1	30	152	11	6	26	39

Western hemlock / dwarf Oregon grape - salal

TSHE / BENE · GASH — WILL

CHS1 24

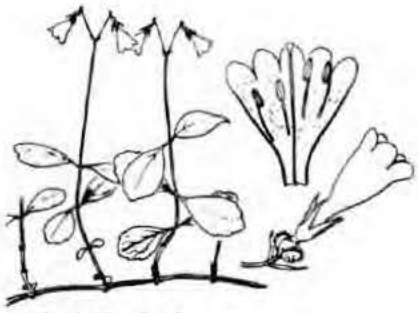


GASH
Gaultheria shallon
Salal

BENE
Berberis nervosa
Dwarf Oregon grape

ACCI
Acer circinatum
Vine maple

VISE
Viola sempervirens
Redwoods violet



LIBO2
Linnaea borealis
Twinflower

Western hemlock / dwarf Oregon grape - salal
TSHE/BENE - GASH — WILL
CHS1 24

Elevation: 2265, 1160-3700
% Slope: 35, 0-80
Aspect: Southwest, (All).
Landform: Well-drained slopes below 3000 feet elevation.

Soils: Fairly deep and moderately rocky. SRI 14, 16, 21, 23 are common.

Total soil depth: 45, 24-65
Effective depth: 37, 9-60

Dominants	Cov	Cons
PSMEM	53	100
TSHEM	24	84
TSHER	8	88
THPLR	5	46
.....		
GASH	34	100
BENE	29	100
ACCI	25	90
VAPA	3	81
RUUR	1	79
.....		
POMU	9	86
VISE	4	75
LIBO2	11	70

The larger amounts of salal than in other dwarf Oregon grape associations indicate slightly drier conditions. This association is in the middle of the gradient from the more mesic western hemlock/dwarf Oregon grape association to the drier conditions in the western hemlock/salal association. Regeneration of Douglas-fir in clearcuts should not be difficult if stands are quickly established. Ceanothus spp. may be significant competitors in some places. Soils are generally resistant to the effects of moderate slash fires. Wildlife use is low or moderate. Little thermal cover is available and herbaceous forage is moderately abundant.

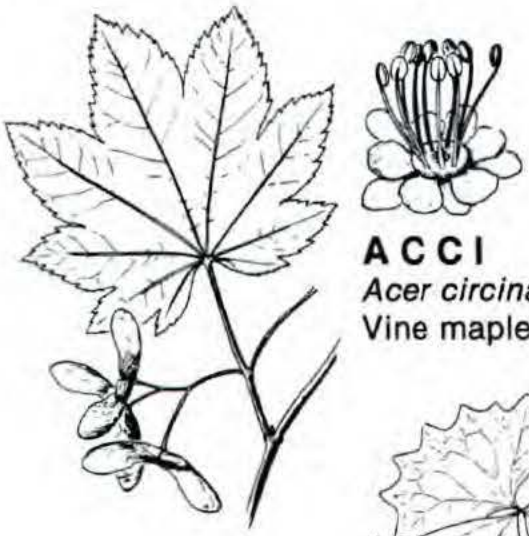
	Site Index Douglas-fir	Basal Area sq ft/ac	Herbage lbs/ac	Vine Maple	Salal	Rhodo-dendron	Dwarf Oregon Grape
				forage lbs/ac			
Mean	133	324	249	23	106	18	150
SE	1	28	123	13	14	10	82

Western hemlock / dwarf Oregon grape / vanilla leaf

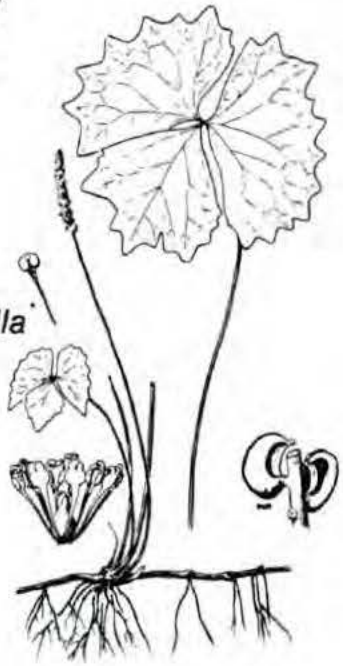
TSHE / BENE / ACTR

CHS1 14

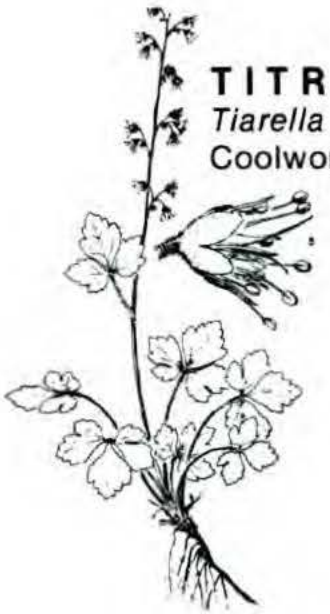
BENE
Berberis nervosa
Dwarf Oregon grape



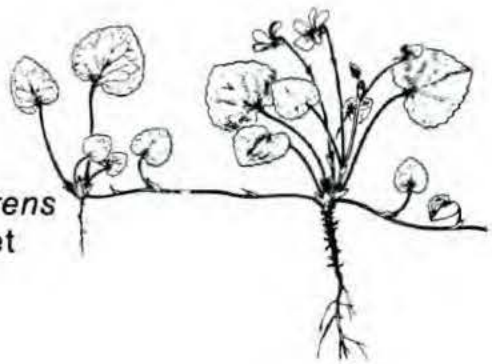
ACCI
Acer circinatum
Vine maple



ACTR
Achlys triphylla
Vanilla leaf



TITR
Tiarella trifoliata
Coolwort foamflower



VISE
Viola sempervirens
Redwoods violet

Western hemlock/dwarf Oregon grape/vanilla leaf
TSHE/BENE/ACTR
CHS1 14

Elevation: 2861, 1100-4050
% Slope: 26, 0-69
Aspect: Southwest, (All).
Landform: Gentle, southwest-facing slopes between 2000-4000 feet elevation.

Soils: Deep with a substantial coarse fragment component. SRI units 16 & 66 are common.

Total soil depth: 42, 8-66
Effective depth: 35, 5-59

Dominants	Cov	Cons
PSMEM	56	100
TSHEM	28	86
TSHER	6	89
.....		
BENE	31	100
ACCI	22	86
RUUR	2	82
ROGY	2	80
.....		
ACTR	12	84
VISE	4	84
ANDE	2	84
TITR	6	75
LIBO2	11	73

This association occurs in the relatively dry and cool portion of the western hemlock series. Summer drought develops more frequently and intensely than in the western hemlock/Oregon oxalis association. The growing season is long and relatively cool. Conifer growth is generally better than in the western hemlock/dwarf Oregon grape association. Regeneration can be difficult on some sites, due to planting problems in rocky soils, Ceanothus spp. competition, gopher damage, and summer drought. Sites can dry out very quickly in the spring, especially when severely burned. Summer frost can be a problem at upper elevations. Once established, trees should grow very well. Most big game use occurs during the summer.

	Site Index Douglas-fir	Basal Area sq ft/ac	Herbage lbs/ac	Vine Maple	Salal	Rhodo-dendron	Dwarf Oregon Grape
				-------forage lbs/ac---------			
Mean	158	400	262	9	23	-	114
SE	1	26	103	9	21	-	37

Western hemlock / Oregon oxalis
TSHE/OXOR — WILL
CHF1 11

BENE
Berberis nervosa
Dwarf Oregon grape

VAPA
Vaccinium parvifolium
Red huckleberry

GATR
Galium triflorum
Sweetscented bedstraw

POMU
Polystichum munitum
Swordfern

OXOR
Oxalis oregana
Oregon oxalis

Western hemlock / Oregon oxalis
TSHE/OXOR — WILL
CHF1 11

Elevation: 1938, 1300-3400
% Slope: 30, 0-103
Aspect: Northerly, (All)
Landform: Moist sites at low elevation on gentle, northerly facing slopes.

Soils: Fertile, deep, and well watered SRI units 8, 13, 15, 16, 23, 25, and 33 are common.
Total soil depth: 47, 20-78
Effective depth: 30, 15-49

Dominants	Cov	Cons
PSMEM	42	97
TSHEM	32	95
THPLR	2	45
TABRR	8	64
.....		
VAPA	1	88
BENE	5	85
ACCI	25	82
RUUR	2	70
.....		
OXOR	52	100
POMU	30	98
TROV	1	67
VAHE	5	64

This association is found on moist, fertile sites below 3500 feet elevation throughout the Forest. Tree growth rates are high. Regeneration should be easy. Red alder and vine maple competition can develop on some sites. Mountain beaver may be present. Soils are moist most of the growing season and subject to compaction. Soils are generally resistant to impacts from moderately hot slash fires. Wildlife habitat values are often high in natural stands. Herbaceous forage is abundant. This type often occurs in riparian zones where it provides important wildlife habitat and contributes to water quality. There is a good opportunity to manage for old-growth structure over a relatively short time period in this association.

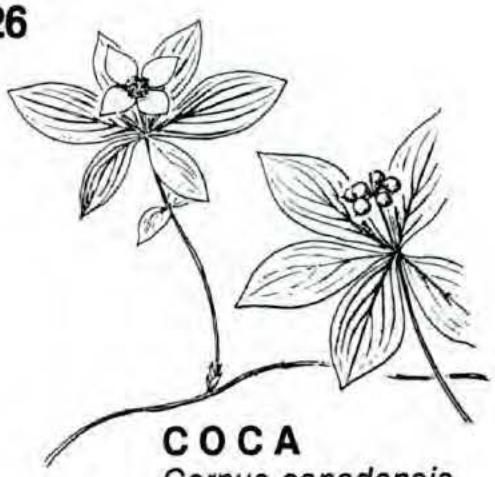
	Site Index Douglas-fir	Basal Area sq ft/ac	Herbage lbs/ac	Vine Maple forage lbs/ac	Salal forage lbs/ac	Rhodo-dendron forage lbs/ac	Dwarf Oregon Grape forage lbs/ac
Mean	158	351	688	16	5	2	11
SE	1	20	135	7	3	2	5

Western hemlock / rhododendron - Alaska huckleberry / dogwood bunchberry

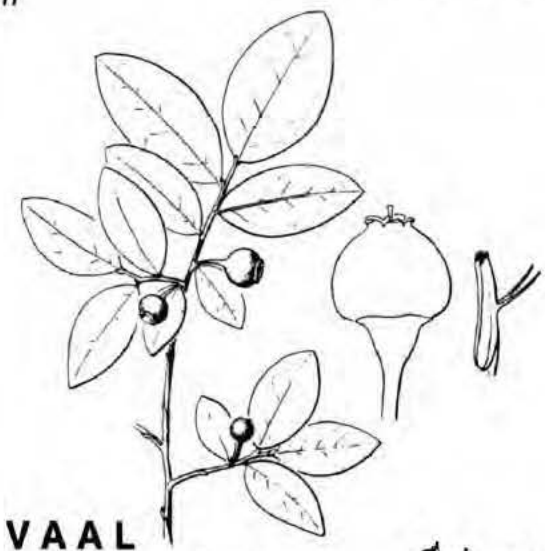
TSHE / RHMA - VAAL / COCA

CHS3 26

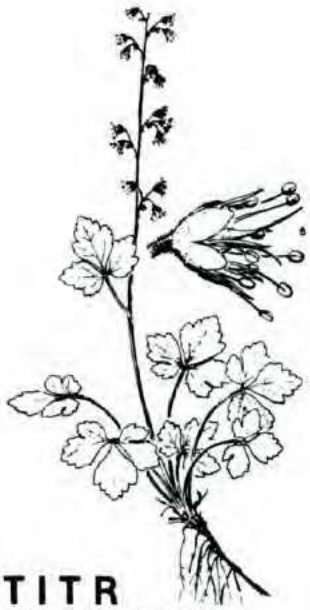
RHMA
Rhododendron macrophyllum
Rhododendron



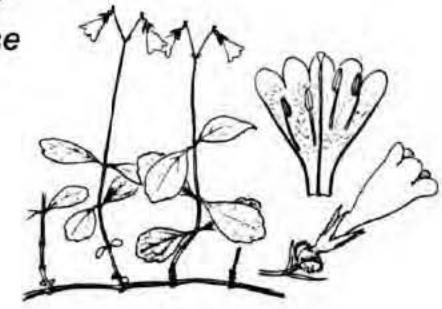
COCA
Cornus canadensis
Dogwood bunchberry



VAAL
Vaccinium alaskaense
Alaska huckleberry



TITR
Tiarella trifoliata
Coolwort foamflower



LIBO2
Linnaea borealis
Twinflower

Western hemlock / rhododendron - Alaska huckleberry / dogwood bunchberry
TSHE / RHMA - VAAL / COCA
CHS3 26

Elevation: 3073, 2190-3550
% Slope: 29, 1-65
Aspect: Northeast.
Landform: Moderately steep slopes above 2000 feet elevation.

Soils: Well-drained and often rocky. SRI units 13, 16, and 25 are common.

Total soil depth: 48, 30-60
Effective depth: 35, 24-48

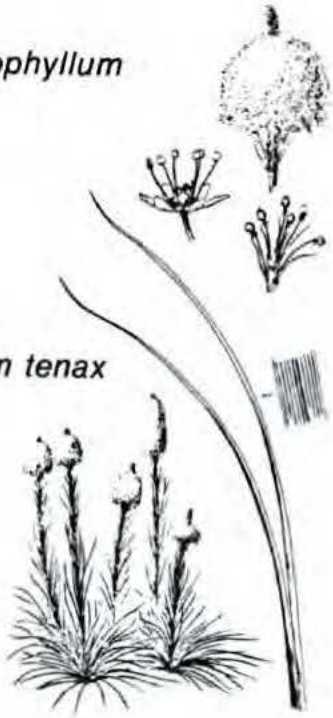
Dominants	Cov	Cons
PSMEM	43	100
TSHEM	30	100
TSHER	11	73
TABRR	8	64
.....		
RHMA	30	100
BENE	10	100
VAPA	4	91
VAAL	17	82
ACCI	26	64
.....		
COCA	11	91
LIBO2	22	91
TITR	3	64

This association occurs in the transition between the Pacific silver fir and western hemlock zones. Since it occurs on north aspects at upper elevations, transpirational demands and growing season drought stress are relatively low. Winter snow accumulations can be substantial and summer frost may occur. Conifers often appear chlorotic, possibly due to nitrogen deficiency. Conifer growth is moderately good. Some sites will be difficult to plant due to rocky soils. Competition from rhododendron, huckleberries and other shrubs could develop after clearcutting. Ceanothus spp. may be important competitors on south-facing slopes. The stony, nurtient poor soils which are common are sensitive to fire impacts. Wildlife use appears to be minimal.

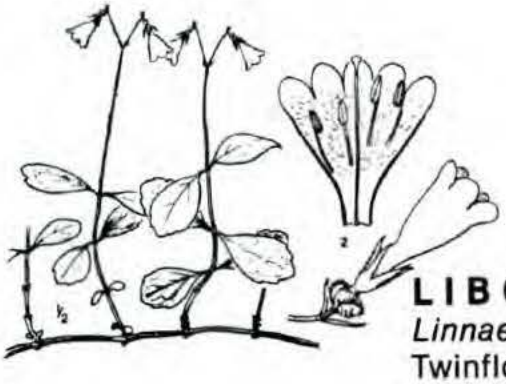
	Site Index Douglas-fir	Basal Area sq ft/ac	Herbage lbs/ac	Vine Maple forage lbs/ac	Salal forage lbs/ac	Rhodo-dendron forage lbs/ac	Dwarf Oregon Grape forage lbs/ac
Mean	131	389	380	22	5	58	5
SE	1	46	148	22	3	43	5

Western hemlock / rhododendron / beargrass
TSHE / RHMA / XETE — WILL
CHS3 53

RHMA
Rhododendron macrophyllum
Rhododendron



XETE
Xerophyllum tenax
Beargrass



LIBO2
Linnaea borealis
Twinflower

VAPA
Vaccinium parvifolium
Red huckleberry

BENE
Berberis nervosa
Dwarf Oregon grape

Western hemlock / rhododendron / beargrass
TSHE / RHMA / XETE — WILL
CHS3 53

Elevation: 3375, 2130-4400
% Slope: 43, 5-85
Aspect: Southerly, (All).
Landform: Rocky ridges and upper slopes.

Soils: Fairly deep and nutrient poor. Common SRI units include 16, 23 & 61.

Total soil depth: 48, 36-65
Effective depth: 36, 18-64

Dominants	Cov	Cons
PSMEM	38	100
TSHEM	34	100
TSHER	7	92
THPLR	2	46
.....		
RHMA	52	100
BENE	9	97
VAPA	3	87
ACCI	18	54
.....		
XETE	19	100
LIBO2	8	85
GOOB	1	64

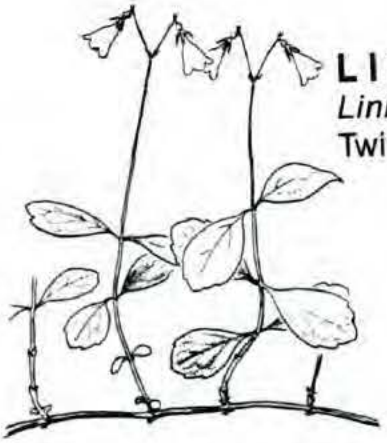
Environmental conditions in this plant association are among the most severe in the western hemlock zone. Sites are often dry and exposed. Winters are usually harsh. Summers are hot and dry. Summer frost may occur on sites above 3000 feet elevation. Natural stands are widely spaced and chlorotic. Nitrogen may be limiting on some sites. This association has the poorest conifer growth potential in the western hemlock zone. Sites with shallow rocky soils may be difficult to plant. Drought and exposure may limit seedling survival. Ceanothus spp. and rhododendron competition often develop within three to five years following clearcutting. Nitrogen poor or rocky soils on steep sites are sensitive to fire. Big game use is generally low.

	Site Index Douglas-fir	Basal Area sq ft/ac	Herbage lbs/ac	Vine Maple	Salal	Rhodo-dendron	Dwarf Oregon Grape
				forage lbs/ac			
Mean	122	316	419	-	39	18	5
SE	1	18	257	-	33	15	3

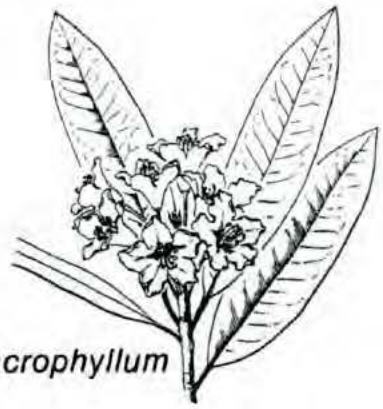
Western hemlock / rhododendron - dwarf Oregon grape

TSHE / RHMA - BENE — WILL

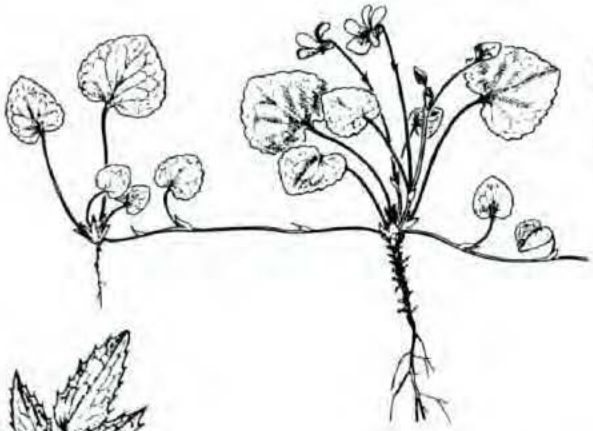
CHS3 52



LIBO2
Linnaea borealis
Twinflower



RHMA
Rhododendron macrophyllum
Rhododendron



VISE
Viola sempervirens
Redwoods violet

BENE
Berberis nervosa
Dwarf Oregon grape

GOOB
Goodyera oblongifolia
Rattlesnake plantain

Western hemlock / rhododendron - dwarf Oregon grape
TSHE/RHMA - BENE — WILL
CHS3 52

Elevation: 3375, 2130-4400
% Slope: 43, 5-85
Aspect: All.
Landform: Widespread on cool dry slopes above 2000 feet elevation.

Soils: Rocky and moderately deep. SRI types 23, 16 33 & 61 are most common.

Total soil depth: 41, 20-60
Effective depth: 29, 10-55

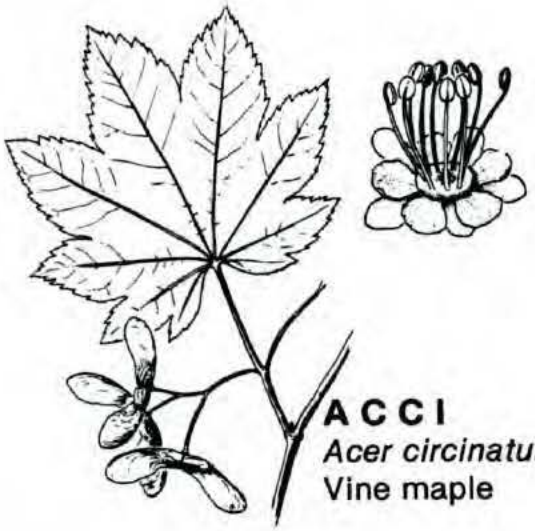
Dominants	Cov	Cons
PSMEM	46	100
TSHEM	34	99
TSHER	6	93
.....		
RHMA	35	100
BENE	25	100
VAPA	3	73
CHUM	4	71
ACCI	14	70
.....		
LIBO2	8	87
VISE	2	77
TROV	1	64
POMU	4	57

Rhododendron dominated communities generally indicate shallow, rocky, moderately droughty soils. The environment is warm to moderately cool with pronounced, but not excessive, summer drought. Tree growth is slower than on similar sites without rhododendron. Trees may be chlorotic, indicating nitrogen deficiency. Shade should enhance Douglas-fir seedling survival. Snowbrush and rhododendron often develop quickly during the first five years after clearcutting. Rapid regeneration is often essential. Soils may be sensitive to moderately hot slash fires. Dry ravel and nitrogen loss may occur on severely burned sites. Wildlife habitat values are not high.

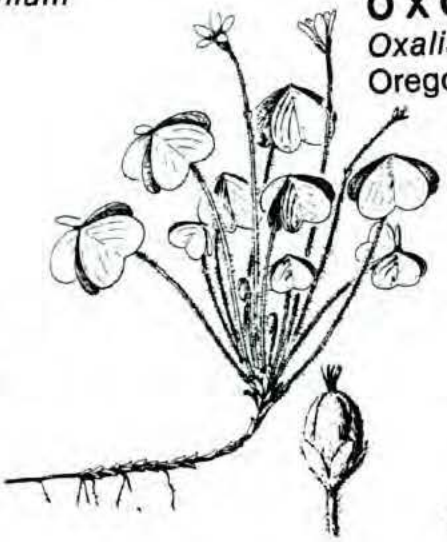
	Site Index Douglas-fir	Basal Area sq ft/ac	Herbage lbs/ac	Vine Maple forage lbs/ac	Salal forage lbs/ac	Rhodo-dendron forage lbs/ac	Dwarf Oregon Grape forage lbs/ac
Mean	136	346	90	21	25	41	33
SE	1	18	30	8	12	18	12

Western hemlock / rhododendron / Oregon oxalis
TSHE / RHMA / OXOR
CHS3 54

RHMA
Rhododendron macrophyllum
Rhododendron

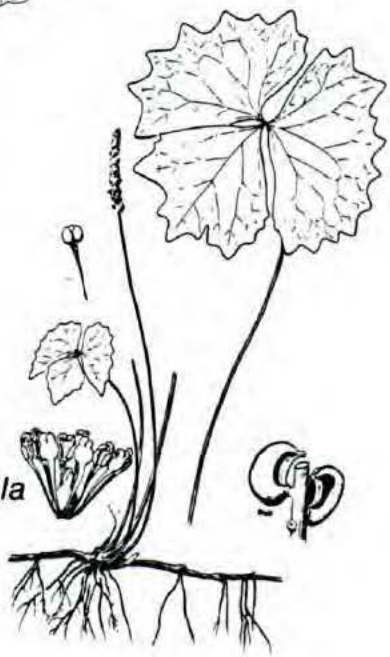


ACCI
Acer circinatum
Vine maple



OXOR
Oxalis oregana
Oregon oxalis

POMU
Polystichum munitum
Swordfern



ACTR
Achlys triphylla
Vanilla leaf

Western hemlock / rhododendron / Oregon oxalis
TSHE / RHMA / OXOR
CHS3 54

Elevation: 3299, 1050-4200
% Slope: 39, 1-70
Aspect: Southeast, (All).
Landform: Fairly steep slopes above 3000 feet elevation at the south end of the Forest.

Soils: Deep with relatively low rock content. SRI 33 is common.

Total soil depth: 55, 36-65
Effective depth: 48, 22-65

Dominants	Cov	Cons
PSMEM	40	100
TSHEM	40	100
THPLM	13	54
TSHER	6	100
.....		
RHMA	34	100
ACCI	18	92
BENE	16	69
.....		
OXOR	37	100
POMU	6	92
ACTR	4	77
TROV	1	77
COLA	5	69

Sites are usually cool, well-watered, and well-drained. The growing season is cool with relatively minor drought development in most years. Summer frost may occur on flats or in frost pockets. Winter conditions are similar to those at the lower portion of the Pacific silver fir zone. Snow accumulations can be substantial. This association presents something of a paradox. Rhododendron types are generally infertile with rocky soils and slow tree growth. This type has relatively good tree growth rates and moderately rich, well-watered soils. Survival of planted Douglas-fir should be good. Competition from rhododendron, vine maple and Ceanothus spp. may develop. Big game use is moderately high, most often for summer range and migration habitat.

	Site Index Douglas-fir	Basal Area sq ft/ac	Herbage lbs/ac	Vine Maple forage lbs/ac	Salal forage lbs/ac	Rhodo-dendron forage lbs/ac	Dwarf Oregon Grape forage lbs/ac
Mean	135	476	360	5	-	228	72
SE	1	50	120	5	-	80	71

Western hemlock / rhododendron - salal

TSHE / RHMA - GASH — WILL

CHS3 51

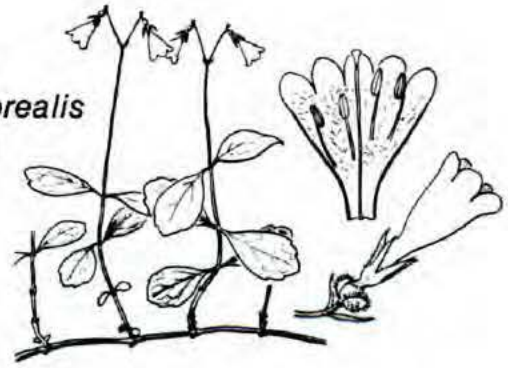
RHMA
Rhododendron macrophyllum
Rhododendron

GASH
Gaultheria shallon
Salal

BENE
Berberis nervosa
Dwarf Oregon grape

VISE
Viola sempervirens
Redwoods violet

LIBO2
Linnaea borealis
Twinflower



Western hemlock / rhododendron - salal
TSHE/RHMA - GASH — WILL
CHS3 51

Elevation: 2568, 1300-3600
% Slope: 37, 0-80
Aspect: All.
Landform: Moderate to steep slopes with rocky soils.

Soils: Often rocky, infertile excessively drained or clay. SRI 16 and 23 are common.

Total soil depth: 43, 18-60
Effective depth: 35, 18-60

Dominants	Cov	Cons
PSMEM	47	100
TSHEM	25	86
THPLM	16	60
TSHER	6	85
THPLR	5	36
.....		
GASH	46	100
RHMA	42	100
BENE	16	96
ACCI	16	71
.....		
LIBO2	8	75
VISE	2	64
GOOB	1	63

This association is found over a wide range of elevations and aspects on warm, dry sites. It indicates severe conditions. The growing season is long and relatively frost-free. Early and substantial summer drought is common. Many stands are chlorotic and appear to be nitrogen deficient. Tree growth rates are slightly lower than the western hemlock/rhododendron-dwarf Oregon grape association. Sugar pine grows better than Douglas-fir on many sites. Summer moisture stress may reduce survival of unshaded seedlings. Soils may be stony and hard to plant. Competition from rhododendron, Ceanothus spp. and other shrubs often develops, making rapid seedling establishment essential. Soils are sensitive to fire effects.

	Site Index Douglas-fir	Basal Area sq ft/ac	Herbage lbs/ac	Vine Maple	Salal	Rhodo-dendron	Dwarf Oregon Grape
				forage lbs/ac			
Mean	128	312	88	3	22	66	22
SE	1	30	59	2	12	23	12

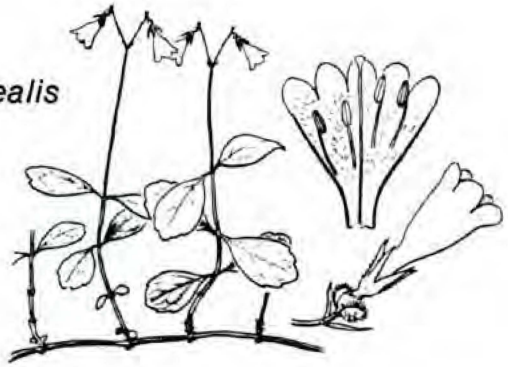
Western hemlock / rhododendron / twinflower

TSHE / RHMA / LIBO2

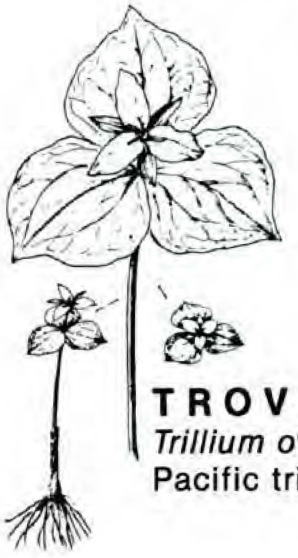
CHS3 55

BENE
Berberis nervosa
Dwarf Oregon grape

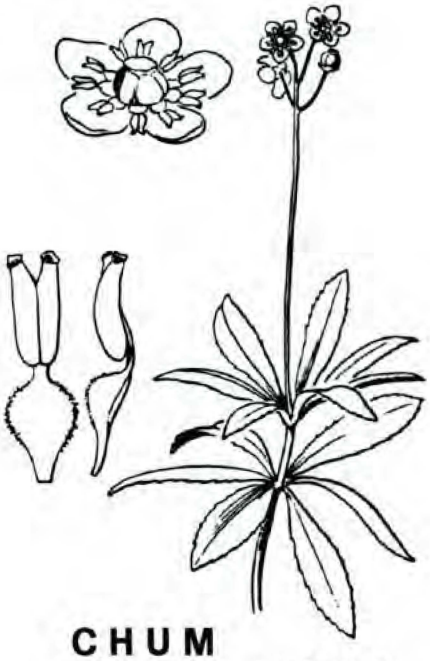
LIBO2
Linnaea borealis
Twinflower



RHMA
Rhododendron macrophyllum
Rhododendron



TROV
Trillium ovatum
Pacific trillium



CHUM
Chimaphila umbellata
Prince's pine

Western hemlock / rhododendron / twinflower
TSHE / RHMA / LIBO2
CHS3 55

Elevation: 3083, 1680-3900
% Slope: 26, 4-75
Aspect: Northwest, (All).
Landform: Gentle terrain at upper elevations in the western hemlock zone.

Soils: Moderately deep to deep, often rocky. SRI units 16 and 23 are common.

Total soil depth: 42, 17-60
Effective depth: 31, 10-48

Dominants	Cov	Cons
PSMEM	41	92
TSHEM	34	92
TSHER	6	85
THPLR	6	85
TABRR	3	46
.....		
RHMA	36	100
BENE	8	92
VAPA	5	77
RUUR	1	77
.....		
LIBO2	24	100
VISE	3	85
GOOB	1	77

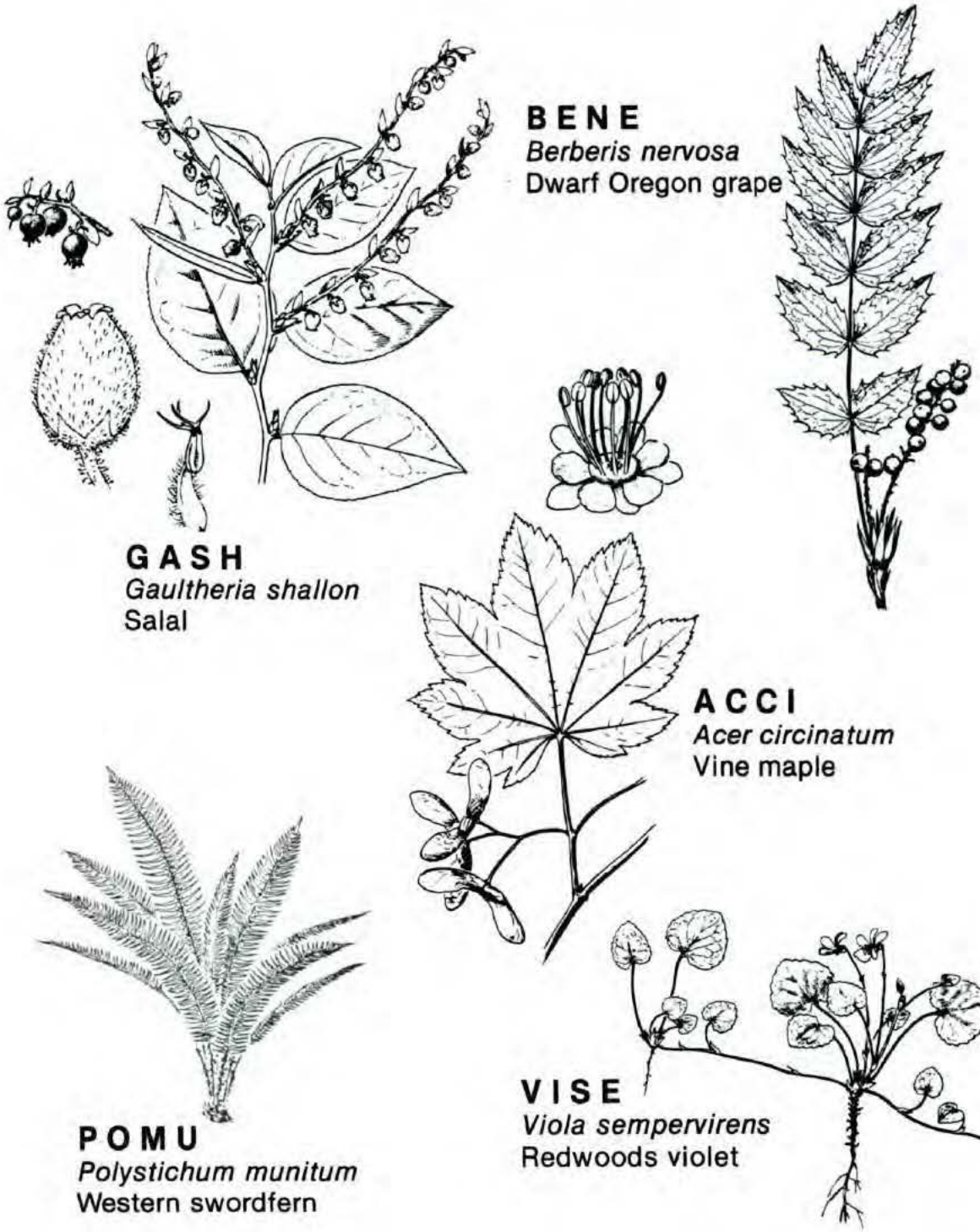
This association often occurs in the transition to the Pacific silver fir zone. Deep winter snowpacks are common and summer frost may occur on flat terrain or in frost pockets. Drought develops by late summer in most years. Douglas-fir growth is moderate. Reforestation with Douglas-fir should not be difficult. Competition from rhododendron and snowbrush frequently develops from 3 to 5 years after clearcutting. Soils have deep duff accumulations and are not as sensitive to fire efects as those of other western hemlock/rhododendron associations. Wildlife use does not appear to be high. Forage is not abundant but wildlife may take advantage of the dense canopy and cool conditions during hot summer days.

	Site Index Douglas-fir	Basal Area sq ft/ac	Herbage lbs/ac	Vine Maple	Salal	Rhodo-dendron	Dwarf Oregon Grape
				forage lbs/ac			
Mean	130	419	20			30	3
SE	1	37	20			30	3

Western hemlock / salal

TSHE/GASH — WILL

CHS1 11



BENE
Berberis nervosa
Dwarf Oregon grape

GASH
Gaultheria shallon
Salal

ACCI
Acer circinatum
Vine maple

POMU
Polystichum munitum
Western swordfern

VISE
Viola sempervirens
Redwoods violet

Western hemlock/salal
TSHE/GASH — WILL
CHS1 11

Elevation: 1994, 900-3200
% Slope: 34, 0-80
Aspect: Southwest, (All).
Landform: Ridges & convex topography. Moderately steep to steep, southerly facing slopes.

Soils: Often shallow. SRI units 15, 21 and 25 are common.

Total soil depth: 34, 6-60
Effective depth: 25, 4-57

Dominants	Cov	Cons
PSMEM	54	100
TSHEM	22	81
TSHER	7	86
.....		
GASH	54	100
BENE	9	93
ACCI	29	90
VAPA	4	79
RUUR	2	79
.....		
POMU	9	74
ANDE	2	71
VISE	2	71
PTAQ	6	60

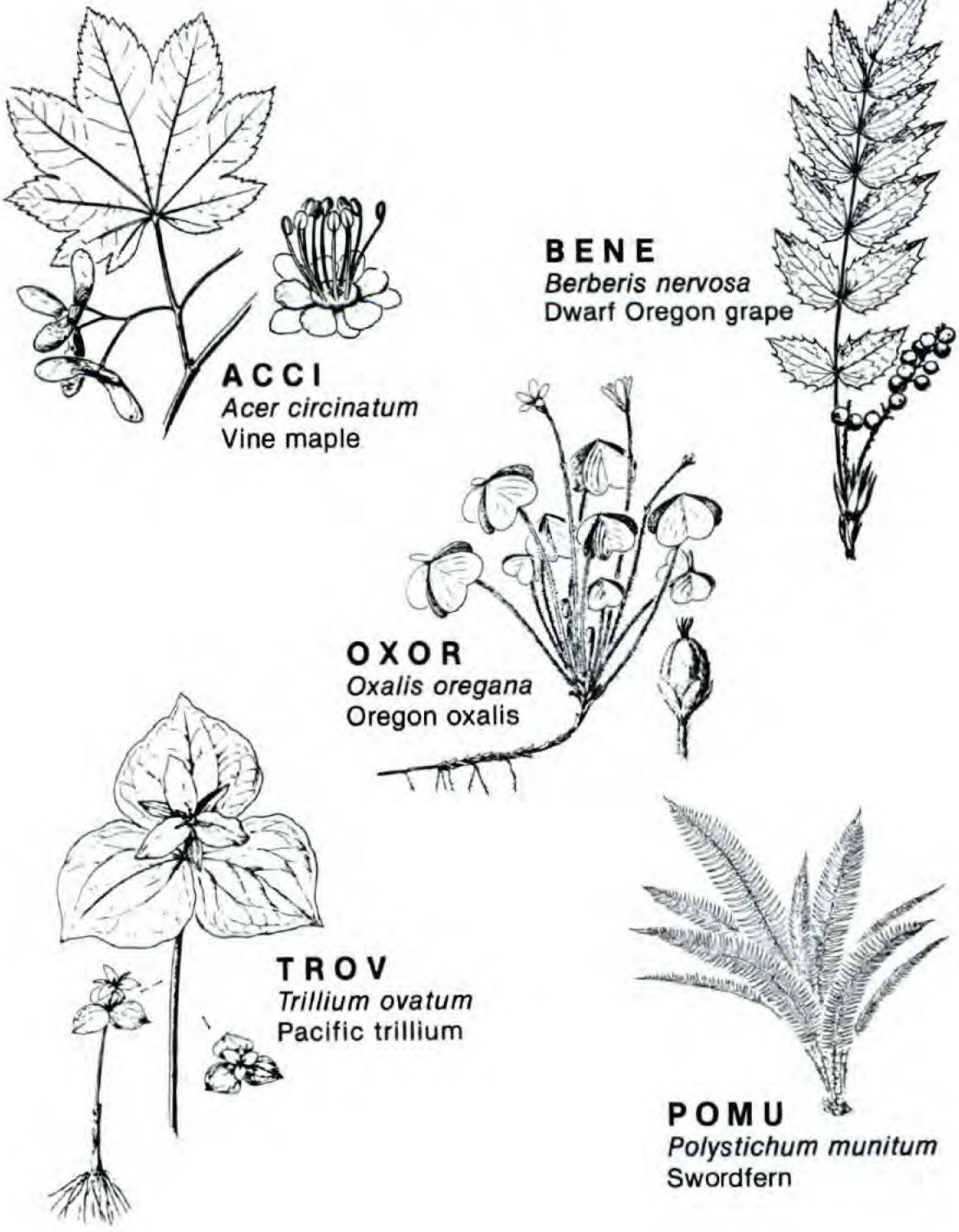
This association is most common on the southern half of the Forest. Dwarf Oregon grape communities often give way to this association as sites become more droughty. It often intergrades into the Douglas-fir-western hemlock/salal association on very dry sites. Growing seasons are long and warm. Regeneration should not be difficult if seedlings are established quickly. Substantial shrub competition may develop from Ceanothus spp. and other species. Douglas-fir seedlings will survive best if some shade is provided. Tree growth is moderately good. Soils may be susceptible to nutrient loss and erosion following slash fires. Big game trails and shrubby forage were abundant in our sample plots.

	Site Index Douglas-fir	Basal Area sq ft/ac	Herbage lbs/ac	Vine Maple	Salal	Rhodo-dendron	Dwarf Oregon Grape
				forage lbs/ac			
Mean	137	286	241	49	131	33	31
SE	1	16	68	41	52	27	15

Western hemlock / swordfern

TSHE / POMU — WILL

CHF1 51



ACCI
Acer circinatum
Vine maple

BENE
Berberis nervosa
Dwarf Oregon grape

OXOR
Oxalis oregana
Oregon oxalis

TROV
Trillium ovatum
Pacific trillium

POMU
Polystichum munitum
Swordfern

Western hemlock/swordfern
TSHE/POMU — WILL
CHF1 51

Elevation: 1834, 1000-2570
% Slope: 43, 9-85
Aspect: Northerly.
Landform: Well-watered lower slopes and benches.

Soils: Deep, fertile and often rocky. SRI units 16, 23, 31, 33 are common.

Total soil depth: 44, 38-52
Effective depth: 36, 25-38

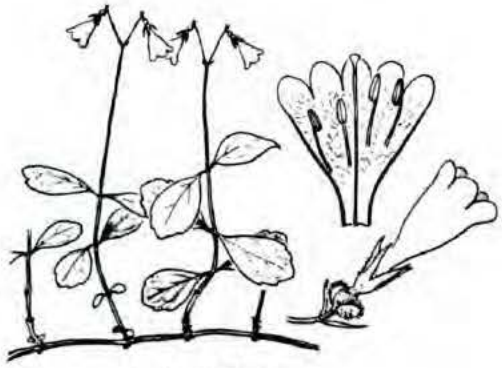
Dominants	Cov	Cons
PSMEM	46	100
TSHEM	37	100
ACMAM	17	67
western TSHER	4	94
.....		
ACCI	15	83
BENE	6	88
GASH	4	67
.....		
POMU	36	100
TROV	1	83
VISE	3	72
GATR	1	61

This association is usually found on toe slopes where moisture from upslope is available through the growing season. Sites are steeper and soils stonier than in the western hemlock/Oregon oxalis association. Tree growth rates are high. Excessive soil compaction or mass movement may accompany timber harvest. Regeneration should be relatively easy. Vine maple or red alder competition may develop on some sites. This association provides optimium habitat for mountain beaver. It is used by big game for winter range and often occurs in riparian zones. Due to rapid tree growth, old-growth structural characteristics can be achieved in a relatively short time period if large dead wood accumulates to acceptable levels.

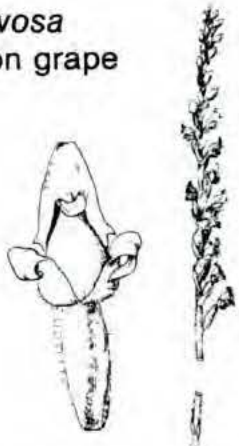
	Site Index Douglas-fir	Basal Area sq ft/ac	Herbage lbs/ac	Vine Maple forage lbs/ac	Salal forage lbs/ac	Rhodo-dendron forage lbs/ac	Dwarf Oregon Grape forage lbs/ac
Mean	159	302	205	6	-	-	16
SE	1	16	65	5	-	-	3

Western hemlock / twinflower
TSHE / LIBO2
CHF3 21

BENE
Berberis nervosa
Dwarf Oregon grape



LIBO2
Linnaea borealis
Twinflower



GOOB
Goodyera oblongifolia
Rattlesnake plantain

VAPA
Vaccinium parvifolium
Red huckleberry

TROV
Trillium ovatum
Pacific trillium

Western hemlock/twinflower
TSHE/LIBO2
CHF3 21

Elevation: 2689, 1280-3380
% Slope: 31, 4-85
Aspect: South, SW, SE.
Landform: Gentle to moderate slopes at upper elevations in the western hemlock zone.

Soils: Often shallow. SRI units 16, 33, and 64 are common.

Total soil depth: 23, 8-45
Effective depth: 20, 5-43

Dominants	Cov	Cons
PSMEM	40	100
TSHEM	23	86
THPLM	19	86
TSHER	9	93
THPLR	3	64
.....		
BENE	3	93
VAPA	3	93
WHMO	3	79
.....		
LIBO2	23	100
GOOB	2	79
TROV	1	79
POMU	5	71

Dense canopies, deep organic accumulations on the forest floor and depauperate shrub and herb layers may indicate that this association is an ususual seral phase or developmental condition of some of the dwarf Oregon grape associations. Environmental conditions are similar to those of upper-elevation sites in the western hemlock/dwarf Oregon grape association. Regeneration may be complicated by Ceanothus spp. competition on some sites. Tree growth is moderate for the western hemlock series. Soils are usually protected by deep duff accumulations and are generally resistant to adverse fire impacts. This association was not found to be heavily used by wildlife in our sample stands. Big game may take advantage of the dense canopy to escape summer heat.

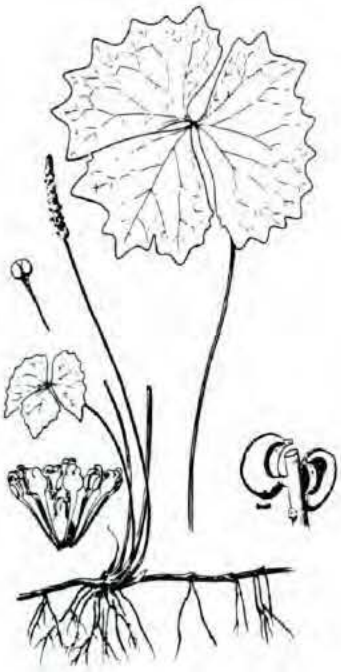
	Site Index Douglas-fir	Basal Area sq ft/ac	Herbage lbs/ac	Vine Maple	Salal	Rhodo-dendron	Dwarf Oregon Grape
				forage lbs/ac			
Mean	148	403	266	-	-	-	6
SE	1	26	124	-	-	-	4

Western hemlock / vanilla leaf
TSHE / ACTR
CHF2 21

ACCI
Acer circinatum
Vine maple

SMST
Smilacina stellata
False solomonseal

BENE
Berberis nervosa
Dwarf Oregon grape



ACTR
Achlys triphylla
Vanilla leaf

TITR
Tiarella trifoliata
Coolwort foamflower

Western hemlock/vanilla leaf
TSHE/ACTR
CHF2 21

Elevation: 2886, 1920-3800
% Slope: 22, 8-58
Aspect: Southwest. Northeast.
Landform: Well-drained, gentle slopes and flats at upper elevations.

Soils: Deep but rocky and well drained. SRI units 15 and 33 are common.

Total soil depth: 54, 35-60
Effective depth: 47, 25-58

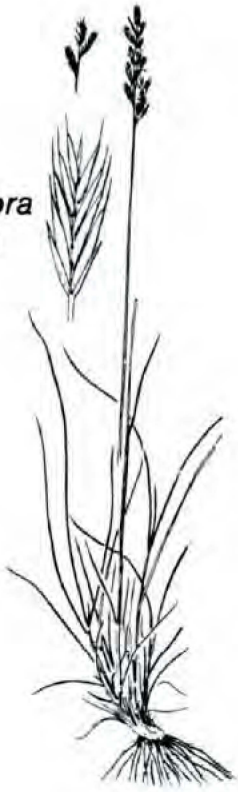
Dominants	Cov	Cons
PSMEM	56	100
TSHEM	30	90
TSHER	8	87
.....		
ACCI	16	90
BENE	5	90
.....		
VISE	5	94
ACTR	15	90
TITR	12	84
LIBO2	8	77
SMST	6	74
ADBI	5	74
ANDI	2	74

The moist-site indicating herbs that occur in this association reflect well-watered conditions. Winter snowpacks can be substantial and persist into the early summer. Summer frost can occur on some sites, especially on flats or in frost pockets. Significant regeneration problems can result from excessively well-drained soils, an abrupt seasonal transition from snowpack and cold soils to warm, dry conditions, pocket gopher damage, competition from Ceanothus spp. and vine maple and occasional summer frost. Tree growth, once stands are established, is among the highest for the western hemlock series. Big game use appears to be extensive, especially in the summer when the dense canopy provides relief from heat.

	Site Index Douglas-fir	Basal Area sq ft/ac	Herbage lbs/ac	Vine Maple forage	Salal forage	Rhodo-dendron lbs/ac	Dwarf Oregon Grape lbs/ac
Mean	151	403	898	5	-	-	19
SE	1	42	289	3	-	-	14

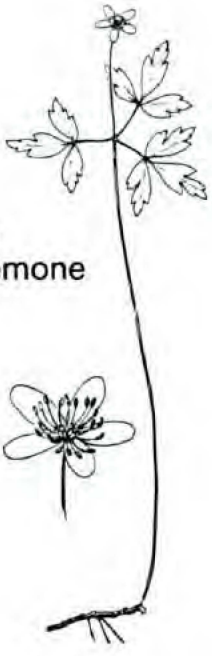
Beargrass - red fescue
XETE - FERU
FM29 11

XETE
Xerophyllum tenax
Beargrass



FERU
Festuca rubra
Red fescue

LICO4
Lilium columbianum
Columbia lily



ANLY2
Anemone lyallii
Nine-leaved anemone

Beargrass - red fescue
XETE - FERU
FM29 11

Elevation: 5200, 4700-5800 Landform: Slopes.
% Slope: 18, 10-30
Aspect: Southwest, (All).

The beargrass-red fescue community is not particularly rich in plant species. There were a total of 23 herb, 1 shrub and 7 tree species in our sample plots. Serviceberry is the most common shrub but generally occurs in small amounts. Scattered Douglas-fir, Pacific silver fir, subalpine fir, noble fir, grand fir, western white pine, and lodgepole pine may be present, especially along the edges of adjacent stands. Western white pine is the most common invading tree species.

Beargrass is the most conspicuous and dominant plant in this community, averaging 50 to 90 percent cover on most sites. Columbia lily and Lyall anemone are consistently present in trace amounts. About 14 other forb species may be present. The few grass species which occur are not abundant enough to be readily noticed. Red fescue was the only species that occurred on a majority of our plots. Long-stolon sedge and other sedges were present in small amounts in fewer than half our plots. The plots in this type were taken in late summer and fall. Some early spring species that may occur were probably not seen. This type may be a prolonged successional stage following disturbance in upper elevation forests. However, the sites we sampled showed no evidence of being previously forested.

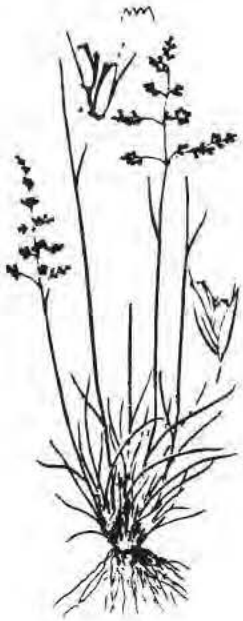
This community is found in cold and dry environments. Most sites are located on mountain tops. Soils are moist during the spring but excessively well-drained during the summer. Surface soil texture varies from gravelly silt loam to silt loam or rocky silt loams. These soils usually grade into gravelly or rocky hardpans, often of compacted glacial till.

The greatest potential for damage to this community is from erosion and runoff. The soils, often formed in pumice, are easily eroded. In some cases, previously forested stands on harsh, cold sites could be converted into this community through careless management. Recovery to closed forest may take a very long time (over 100 years).

Deer and elk feed in this type in early spring and late fall, particularly where adequate hiding cover is available. One sensitive species, Frasera umpquaensis, was present in this community.

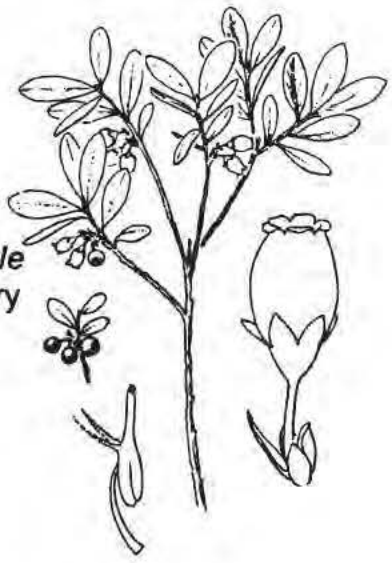
Blueberry - alpine spirea / grass
VACCI - SPDE / GRASS
SW41 21

S P D E
Spiraea densiflora
Subalpine spirea



D E C A
Deschampsia caespitosa
Tufted hairgrass

C A C A
Calamagrostis canadensis
Bluejoint reedgrass



V A O C 2
Vaccinium occidentale
Western bog-blueberry

V A C A
Vaccinium caespitosum
Dwarf blueberry

Blueberry - alpine spirea / grass
VACCI - SPDE/GRASS
SW41 21

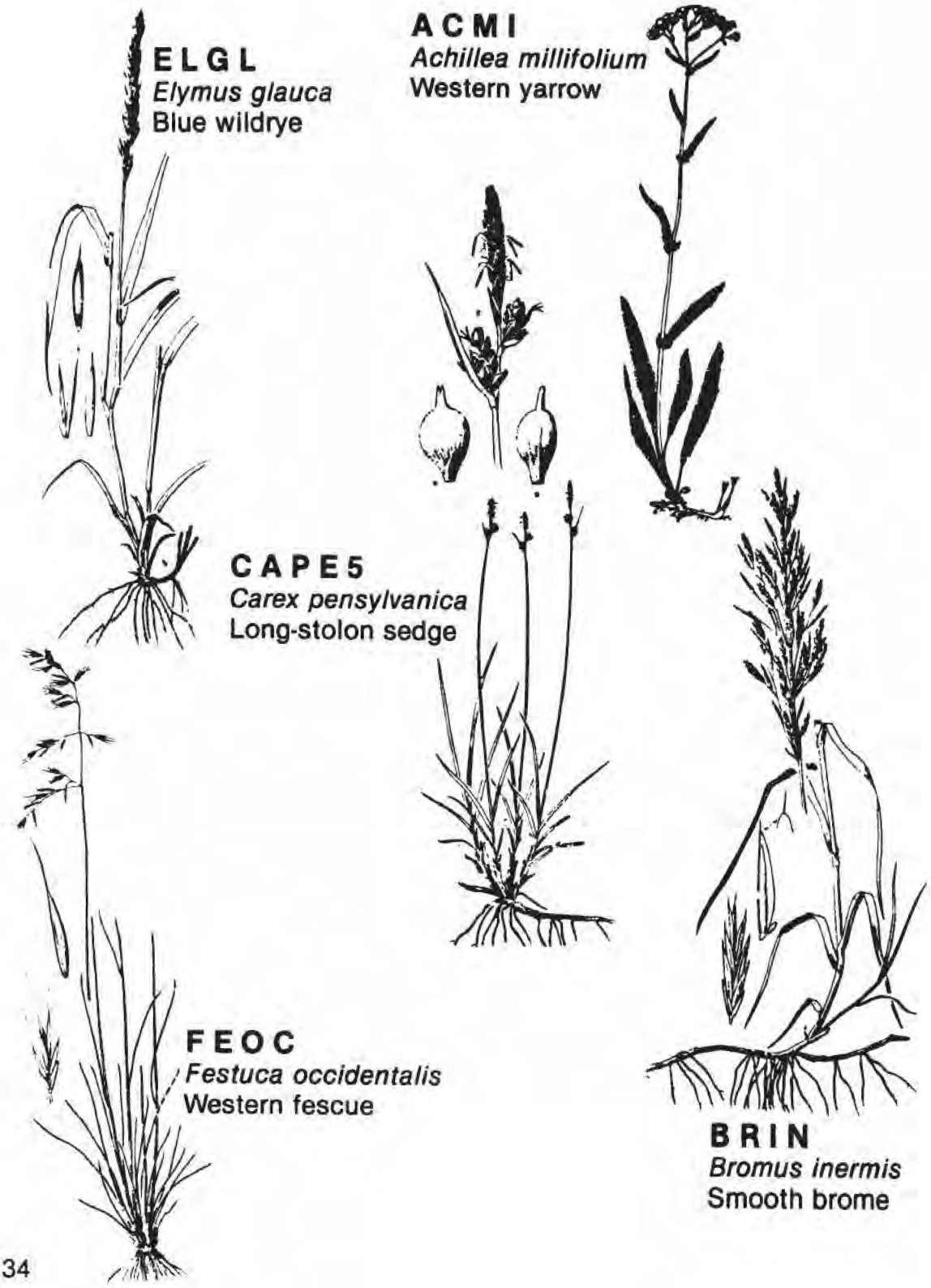
Elevation: 3666 Landform: Valley bottoms.
% Slope: 2
Aspect: Northwest.

This community is described from one unique site but should be expected elsewhere on the Forest. Western bog-blueberry, grouse huckleberry, dwarf blueberry, and subalpine spirea dominated the shrub layer. Grouse huckleberry may invade from adjacent mountain hemlock/grouse huckleberry stands. Bluejoint reedgrass and tufted hairgrass were the major herbs. Timber danthonia, Alaska clubmoss, leathery grapefern, alpine aster, orange agoseris, rosy pussytoes, and cinquefoil were present in small amounts in the single sample plot. Alaska clubmoss and western bog-blueberry are not common west of the Cascade Crest. Beargrass, though present at this site, is an intruder from the adjacent forest stand.

This community is usually found in the ecotone between more moist communities around open water and closed forest. It typically occurs above 4000 feet elevation on deep soils which are saturated for at least a portion of the year. Frequent summer frost, due to high elevation or frost pocket topography, and saturated soils slow or prevent tree establishment.

This community is often found on sites that are small in size and sheltered by the adjacent stand and a body of water. It may depend on the forested stand and regular water supply for the climatic and soil conditions necessary to maintain it. Management activities which disrupt the hydrologic regime are likely to change or eliminate this type. Deer and elk use this community for water and browse. We found no threatened, endangered, or sensitive plants.

Blue wildrye - brome
ELGL - BROMU
GM41 21



ELGL
Elymus glauca
Blue wildrye

ACMI
Achillea millifolium
Western yarrow

CAPE5
Carex pensylvanica
Long-stolon sedge

FEOC
Festuca occidentalis
Western fescue

BRIN
Bromus inermis
Smooth brome

Blue wildrye - brome
ELGL - BROMU
GM41 21

Elevation: 3960, 2440-5800
% Slope: 26, 1-80
Aspect: Southwest.

Landform: Alluvial terraces and slopes.

Several species of grasses and sedges dominate most sites. Grass cover is generally, but not always, greater than forb cover. Ten species of trees were found on our plots, but tree cover values were low, ranging from a trace to 2 percent. Fourteen shrub species occurred. Serviceberry and oceanspray were most common, in amounts ranging from a trace to 2 percent cover. Poison oak occurred at lower elevations.

Blue wildrye is the most characteristic grass, but was not always present. Eight species of bromes occurred in sample plots. Smooth brome was the most constant and was found in 27 percent of our plots with cover ranging from 5 to 30 percent. Danthonia, fescues, and Western needlegrass were present in over a third of our plots. Western brome and red fescue were abundant, covering up to 60 percent of some sites. Cheatgrass brome was present on several plots.

Nine species of sedge and one woodrush species were present on sample plots. The sedges, as a group, are typical of relatively dry communities and one or two species were present on 70 percent of our plots. Long-stolon sedge, was the most common species.

No single forb genus or species was present in more than 45 percent of our plots. Western yarrow was most common, with a trace to 25 percent cover. Nineleaf lomatium and Leichtlin camas were present in 36 percent of our plots. Annual species were more common at lower elevations. The remaining 105 herbaceous species were sporadically present in small amounts.

Our plots in this community occurred on relatively deep soils and dry exposures. Most soils were between 18 and 36 inches deep, but some were as shallow as 9 inches. Communities on north-facing slopes were located on or near ridgetops where shallower soils and exposure compensate for reduced solar radiation. Many sites were protected by stands of timber on two or more sides.

These communities are heavily used by big game species. Pocket gophers were present on all of the sites sampled. Road construction frequently alters the hydrologic system, often producing more well-drained, drier sites.

Common vetch - peregrine fleabane - blue wildrye (Xeric)

VISA - ERPE - ELGL

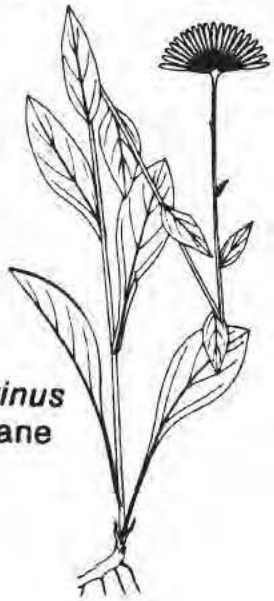
FM30 11

VISA
Vicia sativa
Common vetch

ACMI
Achillea millifolium
Western yarrow

PTAQ
Pteridium aquilinum
Bracken fern

ELGL
Elymus glauca
Blue wildrye



ERPE
Erigeron peregrinus
Peregrine fleabane

Common vetch - peregrine fleabane - blue wildrye (Xeric)
VISA - ERPE - ELGL
FM30 11

Elevation: 4473, 2900-5660
% Slope: 29, 3-70
Aspect: Southerly (All).

Landform: Colluvial fans and failures, slopes and alluvial channels and terraces.

This is a species-rich plant community. The dense herbaceous layer averages 70 percent cover. Our species list includes 25 grass and grass-like species and 111 other herbaceous species. Herb species range from early blooming onions and annual grasses to the late blooming asters and fleabanes. Bracken fern dominated the herb layer in a third of our sample plots. Although no single herb is consistently present, common vetch, peregrine fleabane and western yarrow are common. Grass cover varied from a trace to 20 percent. Blue wildrye, smooth brome, other brome species, and dry-site sedges are usually present in small amounts.

The shrub and tree layers are poorly developed. With the exception of an occasional seedling or lone mature tree, trees are restricted to the perimeter of these openings. Shrub cover is usually less than 5 percent. Serviceberry and thimbleberry are the most common shrub species. Oceanspray is the dominant shrub on drier sites with shallow soils.

These communities most often occur on south-facing, flat to very steep sites with shallow, rocky soils between 2900 and 5660 feet elevation. Soil depth ranges from 12 to 36 inches. Soil texture is usually coarse sand or cobbly or rocky silt loam. Soils on breccia parent material are often cobbly clay loams. Communities on northerly-facing slopes are often in cold valleys or cirque basins on rocky, sandy silt loam soils. Soils are always well drained and dry by late spring or early summer.

Management activities which alter soil or hydrologic conditions are likely to change community structure and diversity. At least one population of Cusick's checkermallow (Sidalcea cusickii), recently removed from the sensitive species list, was found in our survey.

This community generally produces significant amounts of palatable forage for many large and small mammals such as elk, deer, pocket goghers and mice. The profuse flowering in the spring provides an attractive display for recreationists, photographers and botanists.

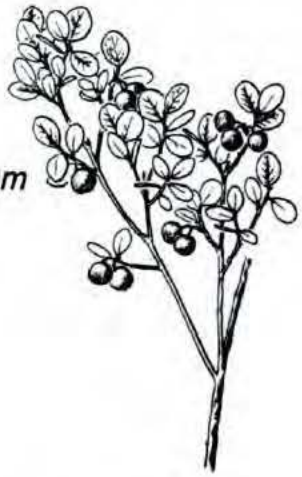
Douglas spirea - bog blueberry / sedge (hydric)

SPDO - VAUL / CAREX (hydric)

SW41 22

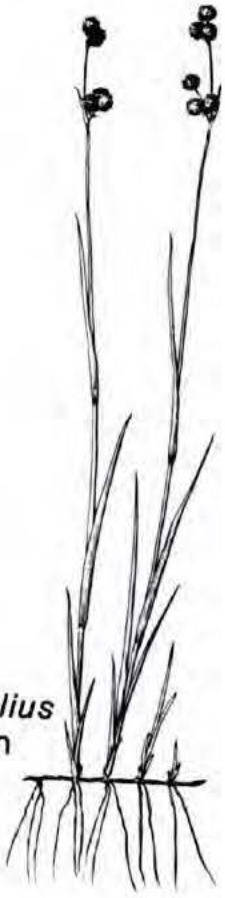
SPDO
Spiraea douglasii
Douglas spirea

VAUL
Vaccinium uliginosum
Bog blueberry



SALIX SPP.
(*Salix lasiandra* **SALA2**
used for example)

CAVE
Carex vesicaria
Blister sedge



JUEN
Juncus ensifolius
Swordleaf rush

Douglas spirea - bog blueberry / sedge (hydric)
SPDO - VAUL / CAREX (hydric)
SW41 22

Elevation: 3757, 2500-5000 Landform: Valley bottoms .
% Slope: 1, 0-3
Aspect: All.

This is a diverse community containing about 74 shurb and herb species. The shrub component dominates the community, averaging 20 to 90 percent cover. Douglas spirea, bog blueberry, and four species of willow were the most common shrubs. The remaining 11 shrub species were present on a few of our sample plots.

Sedges and rushes dominate the herb layer, which contained 27 species in our sample plots. Swordleaf rush, blister sedge, and Sitka sedge were present in over half our plots. One of these species dominated most plots. Woodrush sedge, muricate sedge, and slough sedge were each present in about a third of our plots. Slough sedge is abundant on some sites.

The 34 forb species we found vary considerably in presence and cover. Common willowweed and tofieldia are the most consistently present though neither occurs in large quantities. Kneeling angelica and twinflower marshmerigold are common in small amounts. Grasses, while not abundant, occur in trace amounts on many sites. Bluejoint reedgrass and Thurber bentgrass were the most common species.

Most sites in this community are on alluvial or colluvial deposits, occasionaly earthflows, and often in valley bottoms. The water table is above or only slightly below the soil surface. Organic matter accumulations from 6 to 36 inches deep form the surface horizon. Where we managed to dig to mineral soil, it was silt loam or silt clay loam.

As with other hydric or mesic communities, the distribution, rate of flow, and seasonality of water is critical. Deer and elk use this community sparingly in most cases. Although no sensitive plants were observed, unique plants such as insectivorous sundews, bristly sedge, and porcupine sedge occurred. Poisonous western water-hemlock was present on several plots.

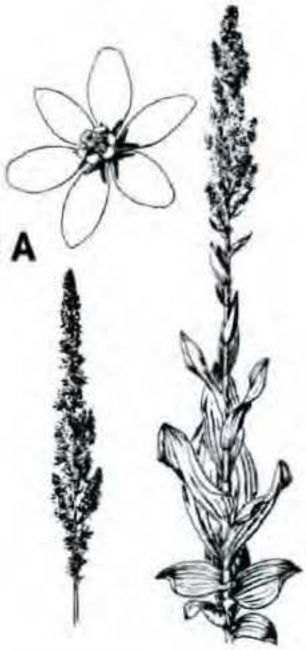
This community usually occurs in mosaics with other hydric and mesic non-forest types in forest openings. It is part of the Forest's wetland and riparian diversity and deserves careful consideration in management activity planning.

False hellebore - common cowparsnip
VERAT - HELA
FW51 11

CALE
Camassia lechtlinii
Lechtlin's camas

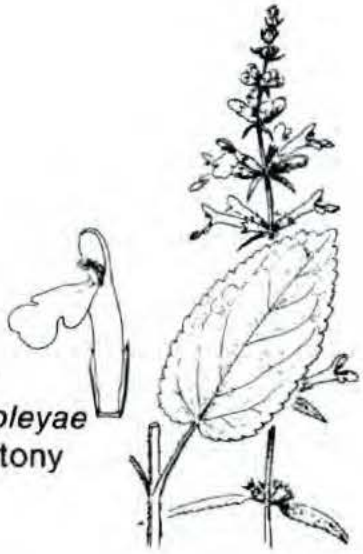
VERATUM SPP.
(*Veratrum californica* used for example)

VECA



SETR
Senecio triangularis
Arrowhead groundsel

HELA
Heracleum lanatum
Common cowparsnip



STCO4
Stachys cooleyae
Cooley's betony

False hellebore - common cowparsnip
VERAT - HELA
FW51 11

Elevation: 4288, 3240-5600
% Slope: 10, 0-56
Aspect: Westerly (All).

Landform: Valley bottoms, draws, cirques, lower slopes.

This community is characterized by a diverse and lush herb layer. The most common and abundant species are California false hellebore, American false hellebore and to a lesser extent, common cowparsnip. Leichlin camas occasionally replaces false hellebore and common cowparsnip as the dominant species. Arrowleaf groundsel and Cooley's betony are common in small amounts. Other forbs such as violets, common monkeyflower, largeleaf avens and peregrine fleabane occur in about half of these communities.

Our species list includes 54 other herbs. Grasses, sedges or rushes are present on most sites, usually with less than 15 percent cover. Bluejoint reedgrass and blue wildrye were the most common grasses. Several other grasses may occur, including American mannagrass, Thurber bentgrass, nodding semaphoregrass, Mertens sedge and foothill sedge.

Trees are rarely present. Shrubs such as salmonberry, devil's club, or Sitka alder may be found in small amounts.

This community occurs on gentle topography in basins, draws or on lower slopes between 3900 and 5600 feet elevation. Soil depth ranges from 28 to more than 36 inches. Soil texture varies but may be silt loam, silty clay loam, clay loam or shotty silt loam. The surface horizon (4 to 10 inches deep) is higher in organic matter than that of plant communities on drier sites. Rock fragments from 2 to 6 inches in diameter may be present. The water table is usually more than 8 inches deep. Small patches of this community occur on steep slopes with perched water tables or in seeps.

This community is often heavily grazed by elk and deer. Big game use seems to decrease as false hellebore cover increases. A sensitive species, Sidalcea setosa, and one that was recently on the sensitive species list, Cusick's checkermallow, (Sidalcea cusickii), were found on several sample sites and have been reported on other areas in this community.

Extensive removal of timber from the perimeter of these openings may reduce big game use and cause environmental changes which may alter the species composition. Changes in hydrology may also alter species composition.

ROCK GARDEN (flat, xeric)
NRR9 11

LOUT
Lomatium utriculatum
Pomo-celery lomatium

SEWA2
Selaginella wallacei
Wallace selaginella

FEOV
Festuca ovina
Sheep fescue

FEID
Festuca idahoensis
Idaho fescue

LOHA
Lomatium hallii
Hall's lomatium

ROCK GARDEN (flat, xeric)
NRR9 11

Elevation: 3558, 2410-4820 Landform: Saprolitic slopes.
% Slope: 34, 5-63
Aspect: Southwest.

This community occurs across the Forest on exposed, rocky ridges where patches of soil accumulate. No single plant species occurred in more than half of our samples of this community. Pomo-celery lomatium, Hall's lomatium, Idaho fescue, sheep fescue, western fescue, and other fescues were present individually or in combination on 65 percent of the sites. No herbaceous species exceeded 8 percent cover on any site and only five species exceeded 3 percent cover on any one site.

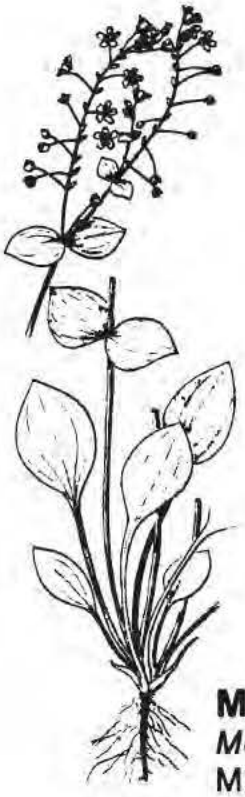
Traces of Alaska cedar, Douglas-fir, and bigleaf maple were present. Nine shrub species occurred, generally with less than 2 percent cover each, including: winter currant, hairy manzanita, greenleaf manzanita, pinemat manzanita, Oregon boxwood, bush rockspirea, oceanspray, dwarf Oregon grape (10 percent cover on one site) and serviceberry. One or two shrub species were usually present but no single species occurred on more than 30 percent of our sample plots. Shrubs and trees in this community grow in moist microsites.

The wide range in environmental conditons in which this association can be found accounts for the high species diversity. The shallow (2-5 inches), gravelly loam, gravelly silt, clay loam, or sandy loam textured soil patches are excessively well-drained even on gentle topography. Slopes greater than 80 percent do not usually retain enough soil to support more than 10 percent herb cover. This community type was not sampled over the full range of its occurrence. Xeric rock garden communities can be found on rock outcrops surrounded by trees throughout the Forest.

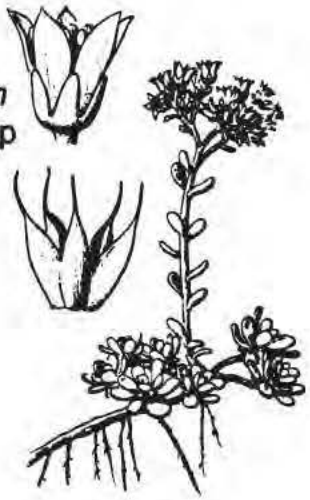
Many of the plants that live here are adapted to harsh, open sites and cannot compete on more mesic habitats. The Sierra onion (Allium companulatum), found in this community, is listed as a threatened species in Oregon.

Deer and elk use of these communities was evident though not intense. Rodents graze on the foliage and dig for bulbs and corms. In some cases bears dig for onion bulbs and the corms of sego lily and camas. Many of the species common in this plant community do not occur elsewhere on the Forest. The main threats to this community type will be rock quarrying and log skidding during timber harvest.

ROCK GARDEN (steep, moist)
NRL9 12

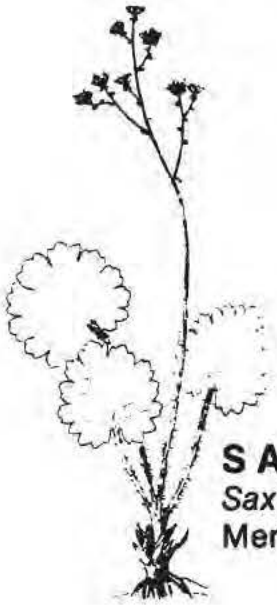


MOSI
Montia sibirica
Miner's lettuce

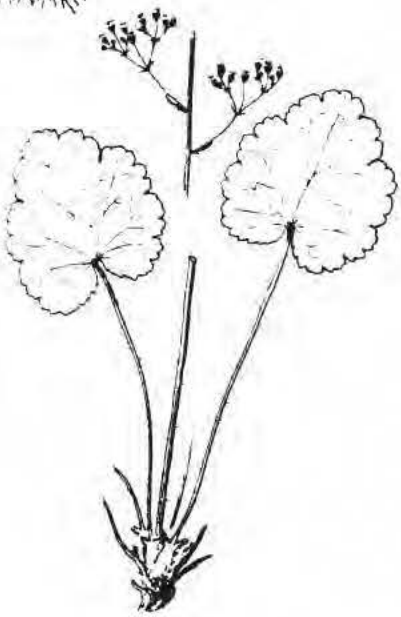


SESP
Sedum spathulifolium
Spatula-leaf stonecrop

ROCA
Romanzoffia californica
California mistmaiden



SAME3
Saxifraga mertensiana
Mertens saxifrage



HEUCHERA SPP.
(*Heuchera micrantha* **HEMI**

ROCK GARDEN (steep, moist)
NRL9 12

Elevation: 3605, 2410-4820 Landform: Rock outcrops.
% Slope: Greater than 80%.
Aspect: All.

This type is a mix of wet and dry plant communities in alternating patches according on moisture availability. Wet or dry adapted species dominate depending on local conditions.

Although trees are not characteristic of this community, an occasional seedling or dwarfed Douglas-fir or western hemlock hangs from a local soil deposit or rock crevass. Shrub-like trees usually cover less than 5 percent of the area. Mosses and forbs dominate the ground cover. Indian lettuce, saxifrages, stonecrops, mistmaidens, and alumroots in various proportions characterize the forb cover. Alumroots are more abundant in shaded areas. Indian lettuces, saxifrages, and mistmaidens thrive in sunlight. Riceroot fritillary is frequently present in soil patches. Aspidotis and rockbrakes are generally present in small amounts in drier parts of the community.

Steep, moist rock gardens occur across a wide range of environmental conditions. They occur from 1600 feet to over 5000 feet elevation on slopes over 80 percent at all aspects. Many rock gardens occur on steep bedrock at the foot of grass-forb or timber dominated terraces. Site size varies from 2 to 60 or more feet in height and 10 to 100 or more feet in length.

Adjacent forest canopies often shade extensive portions of steep rock gardens. Wet, seepy conditions persist at least to mid-July. Moist rock gardens also form in perennially wet sites adjacent to waterfalls. This type was not well sampled. Lush vegetation, particularly in the shade, holds substrate suitable for species such as fritillary and columbia lily. Soil 5 or more inches deep occasionally accumulates in bedrock pockets, encouraging vegetation development.

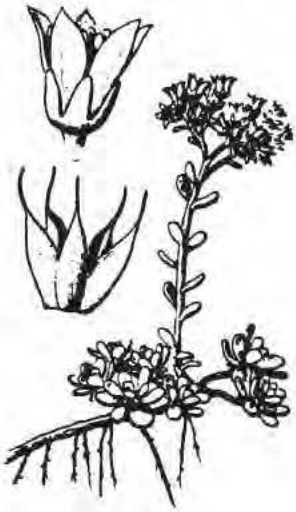
Road cuts and quarries may produce rock faces with water seeps which develop into moist rock gardens. Irregularly cut rock faces provide better niches for plant establishment and may also reduce construction costs. In other cases, construction activities have changed the hydrologic regime and eliminated this community from some sites. The main threats to this plant community are inadvertent or purposeful draining and removing shade provided by an adjacent tree canopy.

ROCK GARDEN (steep, xeric)
NRL9 11

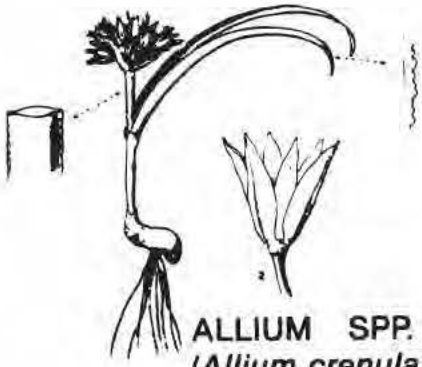
HODI
Holodiscus discolor
Oceanspray

PAMY
Pachistima myrsinites
Oregon boxwood

SALY
Saxifraga lyallii
Lyall saxifrage



SESP
Sedum spathulifolium
Spatula-leaf stonecrop



ALLIUM SPP.
(*Allium crenulatum* used for example)

ALCR

ROCK GARDEN (steep, xeric)
NRL9 11

Elevation: 3041, 2124-3760 Landform: Rock walls with benches
% Slope: Over 100 %. and soil accumulations.
Aspect: Southwest, Southeast.

Dwarfed mature or seedling Douglas-fir, ponderosa pine, chinquapin, Oregon white oak, or madrone may be present in trace amounts. Oceanspray and Oregon boxwood are the most common shrubs and may provide up to 5 percent cover. Other shrubs, present in trace amounts, include: salal, vine maple, dwarf Oregon grape, osoberry, prince's pine, and, at lower elevations, poison oak.

The herb and graminoid flora of dry, vertical rock gardens share some early-flowering species found in steep, moist rock gardens. California mistmaiden, Thompson's mistmaiden, and chickweed monkeyflower, for example, may occur in patches of accumulated soil.

Forbs and grass provide 10-15 percent total cover. Spatula-leaved stonecrop, onion, and Lyall saxifrage characterize the herb layer of the sites sampled. Cliff penstemon and spreading stonecrop are common at the south end of the Forest.

Landform and parent material are somewhat variable. The sites examined were andesite or basalt rock walls with occasional soil and rocky material accumulations on small benches (2 to 3 feet wide). In other cases, soil accumulations were limited to small, shallow (1-4 inch) pockets. Similar communities may exist on breccia walls but were not sampled. Soil accumulations are usually sandy loam or coarse gravelly loam. The short period of time that adequate soil moisture is available limits species composition. Sufficient vegetation develops on all but the steepest sites to hold enough soil for communities other than rock gardens to develop. Forest canopies from stands growing at the base of xeric rock walls have a significant influence (shade and wind reduction) on the environment of rock walls.

Big game use was restricted to deer browsing on accessible ledges. From the droppings evident, rodent and bird species use these communities at least some part of the year.

Steep, xeric rock gardens are characterized by a relatively small number of species, many of which are unique to these habitats. In many cases these communities are biological islands between which plant migration to sustain genetic diversity is difficult.

Sedge-panicled bulrush (hydric)
CAREX - SCMI (hydric)
MT19 11

SCMI
Scirpus microcarpus
Panicled bulrush

CASI3
Carex sitchensis
Sitka sedge

CAVE
Carex vesicaria
Blister sedge

CACA
Calamagrostis canadensis
Bluejoint reedgrass

MIAL1
Mimulus alsinoides
Chickweed monkeyflower

Sedge - panicled bulrush (hydric)
CAREX - SCMI (hydric)
MT19 11

Elevation: 3936, 2800-5200
% Slope: 2, 0-5
Aspect: Northwest, North.

Landform: Adjacent to streams in glacial cirques or valleys and colluvial failures.

A lush layer of moisture-loving herbs and mosses characterizes this plant community. Fifteen sedge and eight grass species dominate the herb layer. Sitka sedge and blister sedge are the most common sedges. Panicled bulrush is the most common rush. Several grasses are common, including bluejoint reedgrass, Thurber bentgrass and American mannagrass, but none are abundant.

The most common herbs, chickweed mimulus, western St. Johnswort and elephanthead pedicularis, are often also major components of other hydric communities. Twinflower marshmerigold, trailing St. Johnswort and western waterhemlock are occasionally abundant. Lady fern and western shield-fern may be present.

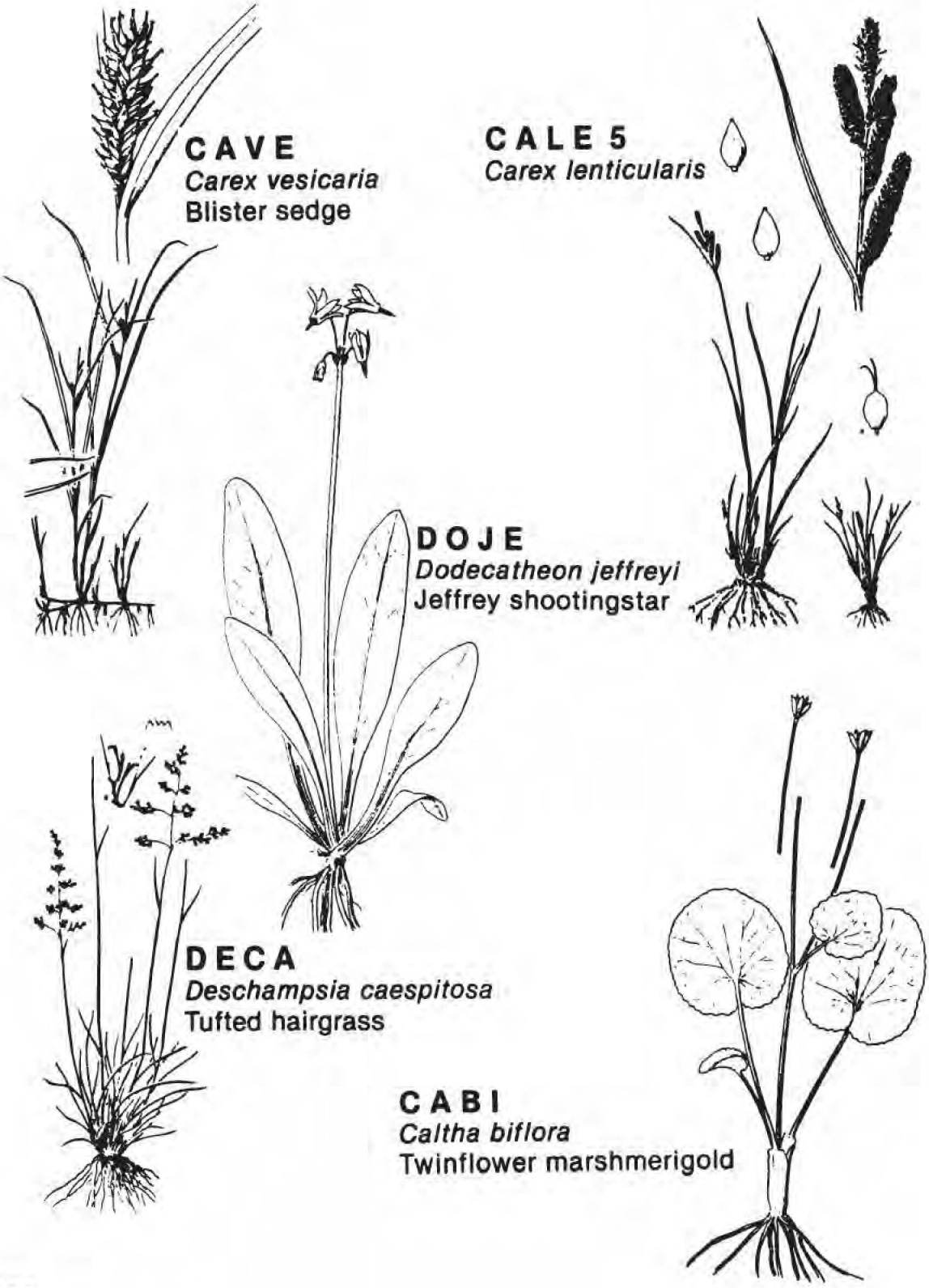
Shrubs are not abundant, but small amounts may occur on some sites. Bog blueberry, willows, and Douglas spirea are usually present. Trees are generally absent.

This community is wet throughout the growing season. Spring or seep water may flow along small channels or stand in depressions. This community is found throughout the Forest, usually adjacent to streams. Most sites are in glacial cirques or valleys or on colluvial failures. Beaver colonies are common and often increase the area of this community by creating high water tables.

Soils are usually developed in alluvial or volcanic pumice deposits. Most soils are histosols, with organic horizons from 8 to 20 inches deep. Average total soil depth ranges from 20 to over 36 inches. Shallower soils often contain large (12 inches and larger) stones in the lower horizons. Soil texture is usually silt or silty clay loam.

This floristically diverse community has many unique and uncommon species. It is excellent habitat for sundew, an uncommon insectivorous plant. It is usually in a mosaic with other meadow types in large forest openings and adds significantly to the total diversity of the opening. Some sites in this plant community are too wet to be used by big game. As with other wet communities, abundant water is vital. Care should be taken not to reduce the rate, distribution or season of waterflow.

Sedge - twinflower marshmerigold
CAREX - CABI
MM39 11



CAVE
Carex vesicaria
Blister sedge

CALE 5
Carex lenticularis

DOJE
Dodecatheon jeffreyi
Jeffrey shootingstar

DECA
Deschampsia caespitosa
Tufted hairgrass

CABI
Caltha biflora
Twinflower marshmerigold

Sedge - twinflower marshmerigold
CAREX - CABI
MM39 11

Elevation: 4600, 4000-5000
% Slope: 2, 0-3
Aspect: Southwest, Southeast.

Landform: Valley bottoms, benches, cirque basins.

Sedges alone or in combination with grasses dominate this community. The combined cover of sedges and grasses always equals or exceeds that of forbs. Blister sedge and Carex lenticularis are the most common species. Muricate sedge and woodrush sedge are found in about half of the communities. Eleven other species of sedges, rushes and woodrushes may be present. Tufted hairgrass, bluejoint reedgrass, Thurber bentgrass or Hall's bentgrass occur on many sites. Sedges may be seral and give way to grasses and forbs later in succession.

Twinflower marshmerigold and Jeffrey shootingstar are usually present. Trailing St. Johnswort, white bog-orchid and 30 or more additional herbs may be present. Sierra boykinia or American yellow skunkcabbage may be abundant on some sites.

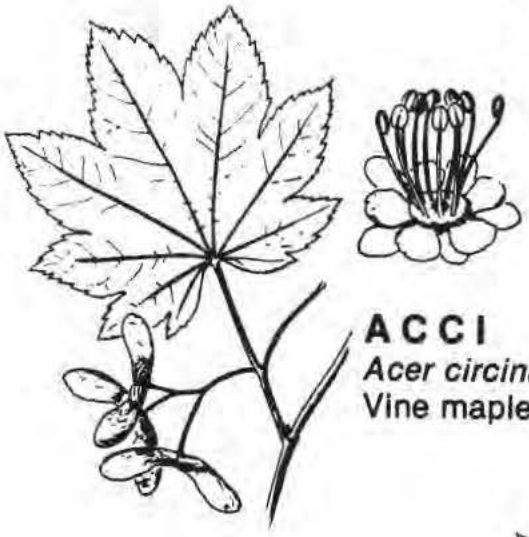
Most sites are between 4,000 and 5,000 feet elevation on gentle, southerly-facing topography. Landform varies from basins in glaciated valleys to benches and basins on colluvial or alluvial material. Volcanic ash overlays the substrate on some sites. The water table is at or above the surface in early summer and just below the surface by late summer. Anaerobic blue clays often occur from 18 to 36 inches below the surface. Some profiles include clay loams and shotty silt loams below 24 inches depth.

Palatable forage is abundant and this community is often heavily used by elk and deer. It often occurs in a mosaic with several other meadow types and tree islands within a forested landscape. These forest openings add significantly to diversity.

Sidalcea cusickii, recently removed from the sensitive species list, was found on one site and occurs in other areas in this community. It may not be absolutely dependent on high water tables and appears to maintain stable populations in this community.

Changes in the location, season, or amount of water flow into this community could alter species composition. Increased drainage could eliminate water-loving species and cause succession to another community.

SHRUB (lava)
NCS1 11



ACCI
Acer circinatum
Vine maple

CHGR
Cheilanthes gracillima
Lace lipfern

SESP
Sedum spathulifolium
Spatula-leaf stonecrop

PEDA
Penstemon davidsonii
Davidson penstemon

HODU
Holodiscus dumosus
Bush rockspirea

SHRUB (lava)
NCS1 11

Elevation: 3390, 3180-3600 Landform: Lava beds.
% Slope: 2
Aspect: Easterly.

Lava beds vary from relatively recent, nearly barren formations to flows several thousand years old. Older lava often supports vegetation ranging from shrub and herb patches to open forest. The vegetative description below characterizes the often extensive patches of accumulated soil on which open forests have developed.

Shrub or perennial herb cover is 10 percent or greater. Shrubs are generally more abundant than herbs. Vine maple, cascara buckthorn and bush rockspirea are most common and average from 5 percent to 10 percent cover. Smaller amounts of greenleaf manzanita and pinemat manzanita may be present. Scattered trees, especially Douglas-fir, Pacific silver fir and western hemlock, occur in local soil accumulation pockets. Where tree cover approches 10 percent, shrub cover tends to decrease, possibly due to competition for water. Two species of ferns, lace lipfern and rockbrake, are common in small amounts. Several perennial forbs may be present. Spatula-leaf stonecrop may be abundant or absent. Davidson penstemon, a drought-adapted species with a woody base, frequently occurs in small amounts (1-3 percent cover). Western saxifrage, parry rush and bottlebrush squirreltail may be present in small amounts. Annual species were not present in our plots but should be expected. Mosses often cover 60 to 90 percent of the rock surface.

The lava beds are environmentally harsh sites. Local collections of fragments and pockets of soil support the scattered patches of vegetation. Sites at 3000 to 3600 feet elevation on more or less flat terrain tend to dry rapidly following snowmelt. By early summer rock surfaces and shallow soil patches are too dry to support most plants.

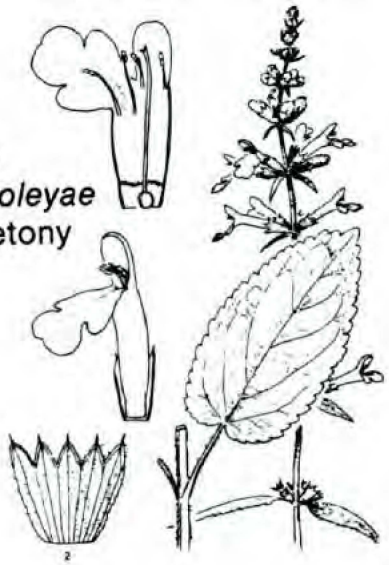
The interesting geologic phenomena and fall color displays invite recreational use. Hiking overland without trails is slow and arduous. Difficult travel and lack of food contributes to low use by animals. Future human use of these sites will probably increase very slowly from present levels.

Sitka alder (rocky soil)

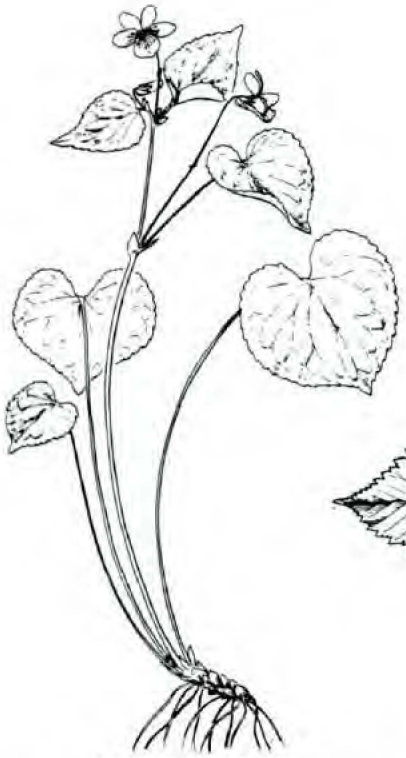
ALSI (rocky soil)

SM81 11

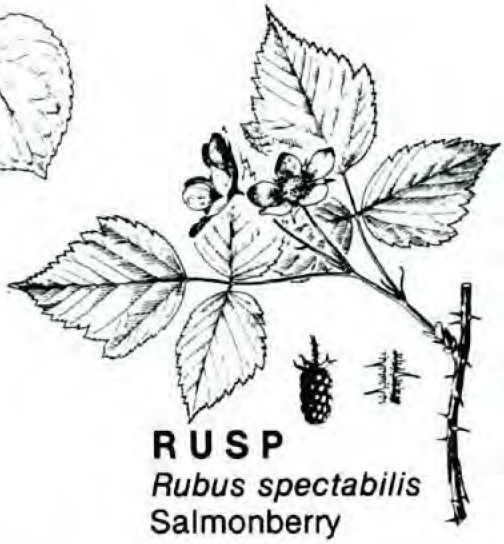
ALSI
Alnus sinuata
Sitka alder



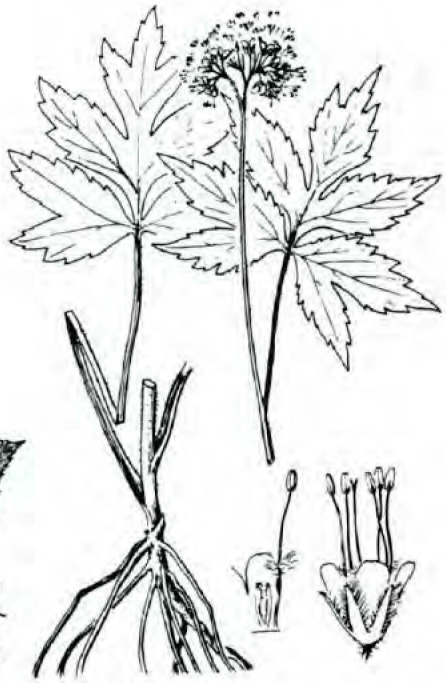
STCO4
Stachys cooleyae
Cooley's betony



VIOLA SPP.
(*Viola glabella* **VIGL**
used for example)



RUSP
Rubus spectabilis
Salmonberry



HYTE
Hydrophyllum tenuipes
Pacific waterleaf

Sitka alder (rocky soil)
ALSI (rocky soil)
SM81 11

Elevation: 4394, 3920-5000
% Slope: 27, 1-55
Aspect: Southeast, (All).

Landform: Steep headwalls and avalanche tracks.

Sitka alder and salmonberry dominate this community. Sitka alder cover varies from 35 to 95 percent and salmonberry from 15 to 50 percent cover. Sitka alder is abundant above 3900 feet elevation, but sporadic below 3900 feet. Stink currant, European red elder and devil's club may be abundant, but do not always occur. Single trees or small clumps may be scattered through the community but average less than 10 percent cover.

Thirty-six forb and grass species and one fern species were present in our samples of this community. Pacific waterleaf and Cooley's betony occurred in nearly all of our plots with up to 25 percent cover. Four species of violet were present and one or two species occurred in 90 percent of our plots with covers ranging from a trace to 35 percent. Small amounts of feathery solomonplume, false solomonseal and bleeding heart were found in over 70 percent of our plots. Hooker fairybells, Menzie's tolmiea, miner's lettuce, common cowparsnip, and bluejoint reedgrass occurred on many plots. Mountain wood-fern and shield-fern were abundant in a few plots. Many other species were sporadically present. Moss cover was between 30 percent and 50 percent on over half the sample plots.

This type often extends into extremely steep headwalls at upper elevations, especially in avalanche tracks. In these cases, salmonberry is not typically present and the herb flora contains some subalpine species such as Sitka valerian.

Soil profiles were often similar: 10 inches to 36 inches or more of gravelly clay loam, silt clay loam, silt loam, or shotty loam to a substrate of large rock (4 inches to 12 inches diameter). About 70 percent of the soils contained 1 to 10 percent rock (1 to 3 inches in diameter) in the upper soil profile. In most cases there were 1 to 2 inches of leaf and other plant material on the soil surface. Soils usually appeared to be colluvially deposited. Management activities that alter water levels or change air currents or climate will affect this community. Several species of birds were observed. Hummingbirds, in particular, were abundant during the late summer blooming period of Cooley's betony. Mountain beaver were frequently found in this community. Where they were present, Pacific waterleaf tops had been browsed. Evidence of deer and elk use was generally scarce even though palatable forage was abundant.

Spirea - willow / sedge
SPIRA - SALIX / CAREX
SW41 23

SPDE
Spiraea densiflora
Subalpine spirea

SPDO
Spiraea douglasii
Douglas spirea

CALU
Carex luzulina
Woodrush sedge

SALIX SPP.
(*Salix lasiandra* **SALA2**
used for example)

SCMI
Scirpus microcarpus
Panicled bulrush

Spirea - willow/sedge
SPIRA - SALIX/CAREX
SW41 23

Elevation:	3936, 2846-5200	Landform:	Valley bottoms, benches and cirque basins.
% Slope:	2, 0-5		
Aspect:	All.		

Total shrub cover ranges from slightly less than 50 percent to nearly 100 percent cover. Douglas spirea is replaced by subalpine spirea at about 4000 feet elevation. Willows and bog blueberry are important components of the shrub layer on most sites. Five other shrub species may be present in smaller amounts.

Several sedges are common. Woodrush sedge is the most consistant species. Blister sedge, Sitka sedge and russet sedge are usually present. Sitka sedge occurs on cooler sites between 3500 and 5000 feet elevation. Eight or more additional sedges may occur.

Several rushes and grasses are common. Panicled bulrush occurs below 5000 feet elevation. Baltic rush, spreading rush and swordleaf rush are relatively common. Several grass species are also important, including: bluejoint reedgrass, tufted hairgrass, spike bentgrass, Hall's bentgrass, and Thurber bentgrass. Over 33 forb species occur in this community, none with regularity. Common willowweed, smooth willowweed and trailing St. Johnswort are the most common. Shootingstars occur on the most moist sites.

This community occurs in valley bottoms, on moist benchs or in cirque basins. The water table is often within 10 inches of the surface. Elevation ranges from 2500 feet to 5000 feet. The topography is flat to undulating.

Soils in our samples were clay loam, gravelly clay loam, silt clay loam or silt loam. Silt loam or silty clay loam often change to clay loam or gravelly clay loam at about 36 inches depth. An organic horizon 1 to more than 10 inches deep is present at the surface.

The hydrologic regime is critical. Both water quantity and season of flow are important. Deer and elk frequently use these areas for foraging and wallows, particularly if hiding cover is available.

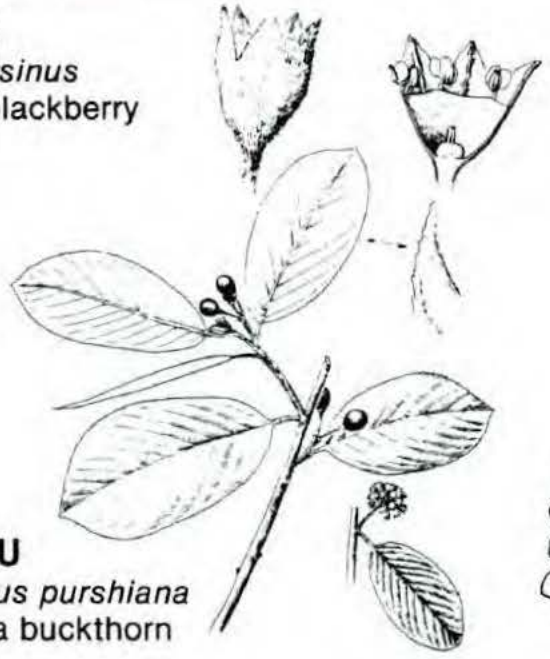
No threatened, endangered or sensitive plant species were found, although adders-tongue (Ophioglossuum vulgatum) is known from similar sites. A rather unique species, northern starflower (Trientalis arctica), is known from only two sites on the Forest, both in this community. It is dependent on fresh, cold water, and open sun.

TALUS
NTS9 11

RICR
Ribes cruentum
Shinyleaf gooseberry

CRCR
Cryptogramma crispa
Rockbrake

RUUR
Rubus ursinus
Trailing blackberry



RHPU
Rhamnus purshiana
Cascara buckthorn

ACCI
Acer circinatum
Vine maple

TALUS
NTS9 11

Elevation: 3130, 2670-3300 Landform: Talus slope.
% Slope: 40, 10-60
Aspect: Southeast.

A paucity of vegetation characterizes the large rock talus community. Tree, shrub or herb cover rarely exceeds one to five percent. If trees occur, they are usually the same species as found in the surrounding forest. Tree seedling survival is extremely low.

Six shrub species were present in our sample plots: shinyleaf gooseberry, cascara buckthorn, trailing blackberry, Oregon boxwood, vine maple, and poison oak. Other shrubs occur in this type but were not present in our sample plots, including: oceanspray, bush rockspirea, common juniper, and, where water flows through the rocks, red-osier dogwood and willows. Total shrub cover does not usually exceed 5 percent.

Herb species, usually amounting to only 2 to 5 percent total cover, are noticeable only on close inspection. Many are cool season annuals and not generally recognizable after mid-July. Rockbrake and licorice fern persist into the dry season. Chickweeed, monkeyflowers, varied-leaf collomia, small-flowered willowweed, and catchweed bedstraw are cool season plants that may be present. Bleeding heart may occur on moist spots. Grasses such as western fescue, sheep fescue and some annual species may occur in areas of soil accumulation.

The jumble of large andesite and basalt boulders supports a meager variety of plants and animals. An occasional shrub extends above the rock pile and small annual forbs or perennial grasses and ferns persist in the few pockets of soil. In most cases, flowing water is absent or so deep beneath the boulders that shrub cover averages only 5 percent. Our sampling was not extensive enough to document the full range of environments in which talus fields occur. Rodents are the most obvious form of wildlife and were most common in pockets of herbs and near the edges of talus fields. The pika (coney rabbit) is a common resident.

In general, this type does not suffer from the impacts of human activities. Large boulders might occasionally be used for slope or streambank stabilization. Based on present knowledge, these communities are most valuable for their contribution to landscape diversity.

Thimbleberry / Pokeweed fleeceflower

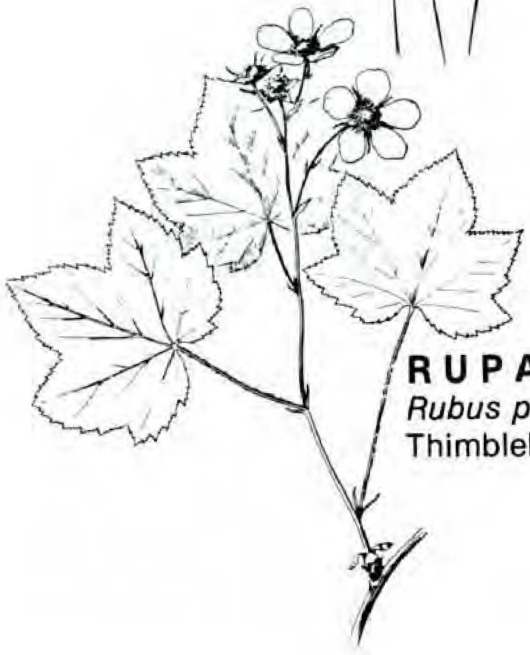
RUPA / POPH

SM59 11

POPH
Polygonum phytolaccefolium
Pokeweed fleeceflower

ARLU
Artemisia ludoviciana
Louisiana sagebrush

PTAQ
Pteridium aquilinum
Bracken fern



RUPA
Rubus parviflorus
Thimbleberry

MECA2
Mertensia campanulata
Idaho bluebells

Thimbleberry / Pokeweed fleeceflower
RUPA / POPH
SM59 11

Elevation: 4638, 4250-4800
% Slope: 36, 25-52
Aspect: Southwest.

Landform: Alluvial fans and colluvial slopes.

Plant species diversity in this community is generally lower than in similar types. The total species list includes five trees, four shrubs, 29 forbs, and four grass and grass-like species. Thimbleberry, bracken fern and pokeweed fleeceflower characterize this community. Idaho bluebells and Louisiana sagebrush are also important. Grass and grass-like species are not abundant. Small amounts of California brome, blue wildrye and sedges may be present. Trees, especially subalpine fir, noble fir, white fir, and Engelmann spruce may be widely scattered.

This type occupies very dry, exposed sites at upper elevations. The five sites examined were at the north end of the Forest. Elevations ranged from 4200 to 4800 feet and aspects were southerly. Slopes were moderately steep. Soils were well-drained silt loams to shotty silt loams greater than 24 inches deep. A consistent lack of soil structure (loosely compacted) seemed to be characteristic of these sites. Bare ground, gravel and rock ranged from 10 percent to 22 percent cover.

Floral displays in this community are not as colorful as in the rock garden types. The species bloom at various times during the summer or are so scattered that colorful blooms are inconspicuous. Some deer and elk use occurs. Mountain beaver may be present. Pocket gophers and other rodents are also often present.

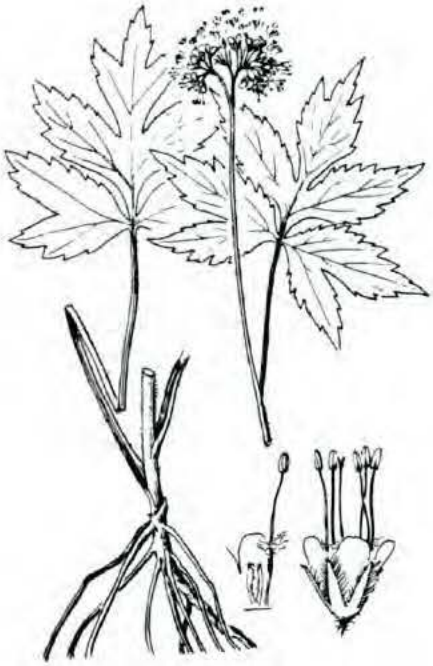
Management activities which alter water movement, soils or microclimate may change the species composition. We found no threatened, endangered or sensitive plants in this community.

Vine maple (rocky soil)
ACCI (rocky soil)
SM81 12

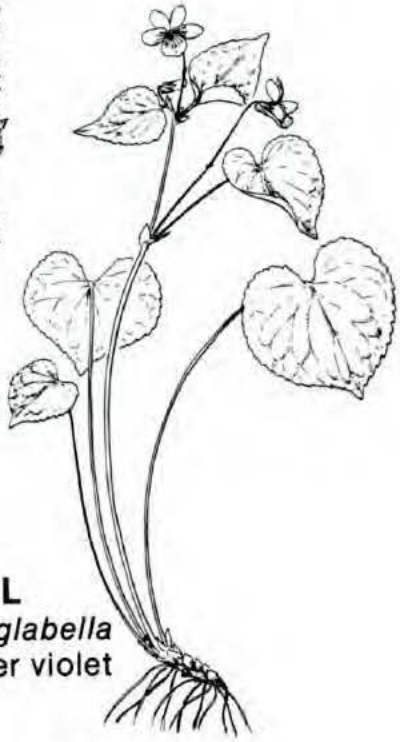
ACCI
Acer circinatum
Vine maple

ALSI
Alnus sinuata
Sitka alder

RIBR
Ribes bracteosum
Stink currant



HYTE
Hydrophyllum tenuipes
Pacific waterleaf



VIGL
Viola glabella
Pioneer violet

Vine maple (rocky soil)
ACCI (rocky soil)
SM81 12

Elevation: 4084, 3920-4600
% Slope: 18, 1-35
Aspect: All.

Landform: Alluvial terraces and colluvial failures.

Vine maple dominates this community, associated with smaller amounts of Sitka alder. Stink currant or European red elder are common on some sites. Six other shrubs occurred in our sample plots in small amounts.

The herbaceous component of this community consists of up to 16 forbs, 2 ferns, and one grass. Grasses, in this case a brome, appear to be invaders, encroaching on the edges or taking advantage of a soil disturbance or canopy opening. The ferns, mountain shield-fern and Anderson's swordfern, are not regularly present (constancy less than 20 percent) and when present are not abundant. Pacific waterleaf is usually the dominant herb, averaging 10 to 30 percent cover. Violets occurred on all plots. Pioneer violet (V. glabella) was the most common. Other forbs, including: bleeding heart, Oregon oxalis, Pacific trillium, false solomonseal, and miner's lettuce were present on about 60 percent of our plots with covers ranging from a trace to 40 percent. Moss cover was generally low. Trees are rare.

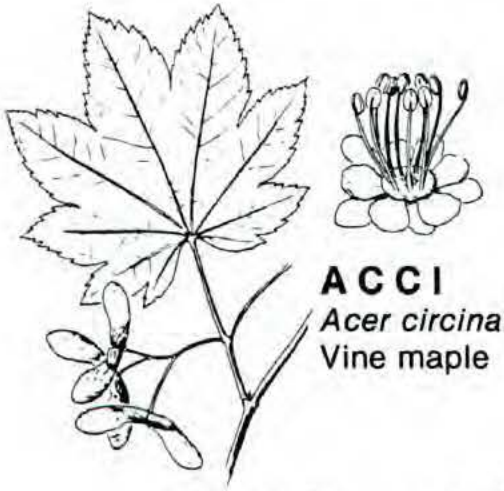
We have a relatively small sample of this community. Sites examined were between 3900 and 4600 feet elevation on gentle to moderately steep slopes. Soils were 7 inches to 24 inches deep over unconsolidated rock or, in one case, a stony clay hardpan. Soil texture varied from silt loam to shotty silt loam and clay loam. Small rocks (1 to 3 inches diameter) were common in the upper soil profile. These communities seem to be on more southerly aspects with drier soils than the Sitka alder (rocky soil) community. There is often an organic layer, 1 to 2 inches thick, on the soil surface. Water channels are generally dry by early summer. Water flowing into mid-season creates wet microsites with a different species composition.

Careful consideration of hydrologic effects should be given to management activities in or adjacent to this community. Many sites are relatively small and surrounded by mature conifer forests. Changes to the environment caused by canopy removal on adjacent sites or road construction could easily change the community composition and structure. Big game use was observed on some sites. Heavy use by mountain beaver was observed on most sites. Pacific waterleaf was heavily browsed by mountain beaver. Several species of birds were observed feeding, but no nests were found.

Vine maple (talus)

ACCI (talus)

NTS2 11

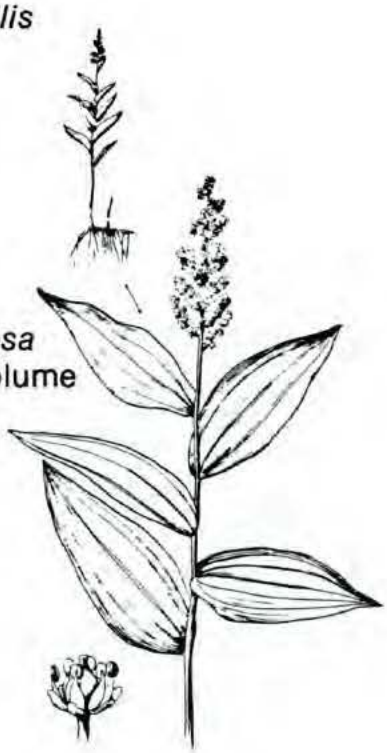


A C C I
Acer circinatum
Vine maple

S A R A
Sambucus racemosa
European red elder

R U S P
Rubus spectabilis
Salmonberry

D I F O
Dicentra formosa
Pacific bleeding heart



S M R A
Smilacina racemosa
Feather solomonplume

Vine maple (talus)
ACCI (talus)
NTS2 11

Elevation:	3487, 2600-4800	Landform:	Colluvial failures,
% Slope:	48, 20-65		headwalls and
Aspect:	Northerly.		avalanche chutes.

This community consists of abundant vine maple (25 percent to 95 percent cover) over a field of large andesite and basalt boulders. European red elder and salmonberry often contribute 5 to 10 percent cover. Gooseberries, cascara buckthorn, and, occasionally, devil's club may be present at less than 5 percent cover. Some 20 species of herbs occur in trace amounts. Bleeding heart, feather solomonplume, and false solomonseal are the most common species. False solomonseal and baneberry may be abundant (up to 10 percent cover) on moist microsites. The single populations of fetid adderstongue (Scoliopus hallii) and Seneca grass (Hierochloe odorata) found on the Forest were in this community type. Perennial grasses, especially western fescue and Idaho fescue, may be present in trace amounts.

Water is near the surface in all vine maple (talus) communities. In spring and early summer, or throughout the year on some sites, water flows through the subsurface rocks or comes to the surface in springs and seeps. Abundant water and shade produce humid microsites carpeted by lush mosses, swordfern and mountain hollyfern communities. Patchy accumulations of fine materials and soil often support diverse herb gardens.

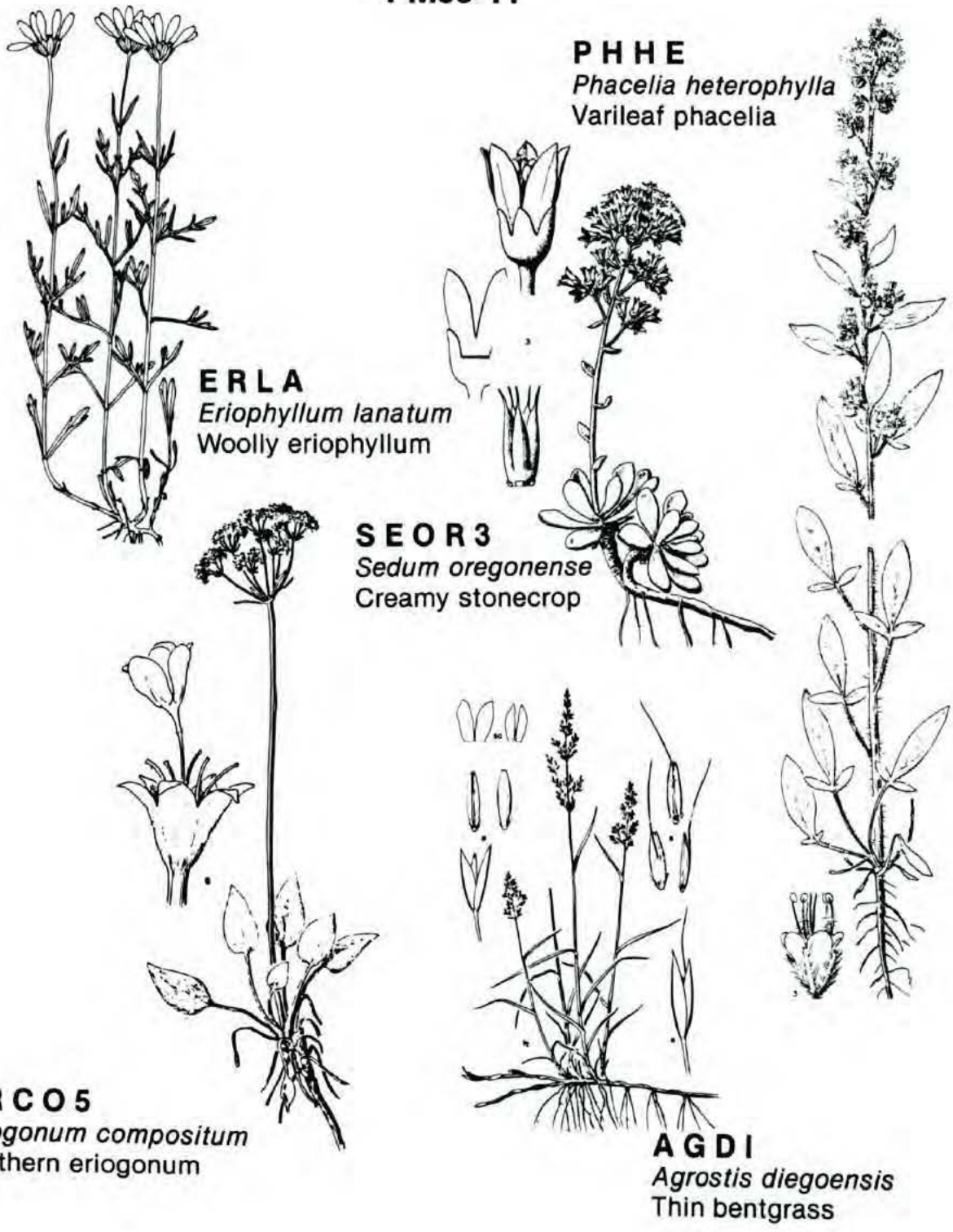
Management activities which alter hydrologic conditions will have the most serious negative impacts on this community. Fetid adderstongue, a member of the lily family found in riparian and wet habitats such as this community, was listed as a Region 6 sensitive species but has recently been removed from the list. It was found in one shrub rock talus community on the Forest and is known from one other location near the Forest (Gate Creek, near Vida, Oregon). Management activities in this community could jeopardize the viability of fetid adderstongue on the Forest.

Pika, other rodents, and several bird species, including hummingbirds, were observed on sample plots. Though substantial palatable browse was available, use by big game animals was minimal. Large, jumbled boulders are probably an effective travel barrier to big game animals.

Woolly eriophyllum - varileaf phacelia (Xeric)

ERLA - PHHE

FM99 11



Woolly eriophyllum - varileaf phacelia (Xeric)
ERLA - PHHE
FM99 11

Elevation: 5080, 4840-5300
% Slope: 60, 40-80
Aspect: Southwest, westerly.
Landform: Slopes and colluvial fans.

Herbaceous cover ranges from 35 to 80 percent, moss cover from 15 to 55 percent, and bare ground from 35 to 50 percent cover. A total of 40 tree, shrub and herb species were identified on the sites inventoried in this community.

Trees are rare, occurring only in isolated pockets of deeper soil. Shrubs make up a small component (less than 2 percent cover) of the community. Common juniper, serviceberry, oceanspray and common snowberry may be found, but usually only a single shrub species occurs on any one site.

Forbs dominate the herbaceous component of this community. Woolly eriophyllum was present on all of the sample plots, averaging 2 to 5 percent cover. Varileaf phacelia was present in trace amounts on about 75 percent of our sample plots. Creamy stonecrop, spreading stonecrop, spatula-leaf stonecrop, mountain eriogonum, sulphur eriogonum, northern eriogonum, and barestem eriogonum were present in various combinations. Creamy stonecrop and northern eriogonum were most constant, with covers ranging from 1 to 10 percent. Seven grass and grass-like species were observed in this community. Thin bentgrass and bottlebrush squirreltail were the most typical for this community, but occured in small amounts.

Shallow soils, from 2 to 6 inches deep, over bedrock are characteristic of this community. Environmental conditions are extremely severe. Sites located on lower or mid-slopes are usually south-facing and dry out early in the summer. Winter snowpacks are often deep. Many sites are on ridges exposed to desiccating winds, blowing snow, and rime ice. The transition to severe summer drought quickly follows snowmelt. Soils are so shallow and well-drained that severe drought develops by early summer. Plant communities which persist under such conditions are fragile and are easily disturbed.

The greatest threat to these communities are activities that disturb or destroy the sparse soil mantle. Some ridge top sites at the north end of the Forest support populations of Gorman's aster (Aster gormanii), currently listed as sensitive. This is a unique community and relatively uncommon component of the Forest's diversity.

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APPENDIX I

Mean relative percent cover (average cover for all plots in which the species occurs) and percent constancy for selected trees, shrubs and herbs of Douglas-fir, grand fir, and western hemlock associations.

ASSOCIATION	PSME/HODI-BENE		PSME/HODI/GRASS		PSME/HODI-WHMO	
# OF PLOTS	16		9		13	
	Mean Relative Cover %	Constancy %	Mean Relative Cover %	Constancy %	Mean Relative Cover %	Constancy %
Mature Trees						
ABGR	10	19	2	22	5	46
ACMA	8	50	6	67	4	38
ARME	4	56	5	44	4	38
CACH	4	19			1	8
CADE	10	50	14	44	17	54
CONU	9	19			7	23
PILA	7	31	8	44	8	31
PIMO					5	15
PIPO			19	33	16	31
PSME	58	100	68	100	51	100
TABR			2	11	20	8
THPL			6	22	5	8
TSHE	2	6			4	15
Total Tree Cover	69	100	81	100	69	100
Regenerating Trees						
ABGR	7	31	1	22	5	46
CADE	2	38	17	22	6	46
PILA	1	44	1	11	1	8
PSME	8	50	3	44	12	54
TABR	1	6			5	8
THPL			3	11		
TSHE	2	19			1	23
Shrubs						
ACCI	21	50	5	22	12	54
ACGLD	2	6	10	11	5	8
BEAQ	2	44	3	78	5	69
BENE	26	100	4	56	7	77
CACH					5	8
CHME	1	25	1	22	1	15
CHUM	1	19	3	11	2	23
COCO2	7	63	4	67	5	92

ASSOCIATION	PSME/HODI-BENE		PSME/HODI/GRASS		PSME/HODI-WHMO	
# OF PLOTS	16		9		13	
	Mean Relative Cover %	Constancy %	Mean Relative Cover %	Constancy %	Mean Relative Cover %	Constancy %
CONU	1	25	2	11	2	54
GASH	3	25			5	23
HODI	10	75	4	78	10	77
LOCI	1	25	1	11	1	15
LOHI	2	38	2	22	1	8
PAMY	1	6			1	8
RHDI	7	63	2	56	2	62
RHMA	22	10			2	8
RILA			1	11		
ROGY	3	94	2	89	4	100
RUPA	1	6	1	11	2	15
RUUR	2	81	2	78	2	69
SYMO	5	94	3	78	5	92
VAPA	2	25			2	23
WHMO	5	94	3	44	20	100
Total Cover:						
High Shrubs	26	10	10	100	24	100
Low Shrubs	40	10	10	100	25	92
Herbs						
ACTR	3	50	1	33	1	38
ADBI	2	69	1	67	2	69
ANDE	1	81	2	44	2	31
ARMA3	2	63	2	78	2	69
BRVU	1	13	9	33	3	31
CABU2	1	13				
CASC2	1	56	1	67		
CLUN	1	6			2	31
COLA					1	8
DIHO	1	69	1	44	2	46
FECA	1	6	2	67	1	8
FEOC	1	6	2	11	2	23
FESU			5	44	3	31
FRVE	1	75	4	78	2	77
GAOR	2	6				
GATR	1	50	1	56	1	46
GOOB	1	38	1	44	1	38
HIAL	1	94	1	100	2	69

ASSOCIATION	PSME/HODI-BENE		PSME/HODI/GRASS		PSME/HODI-WHMO	
# OF PLOTS	16		9		13	
	Mean Relative Cover %	Constancy %	Mean Relative Cover %	Constancy %	Mean Relative Cover %	Constancy %
IRTE	1	13	1	11	2	15
LIBO2	8	50	14	33	4	54
MOSI	1	13	1	44	1	23
POMU	4	94	2	78	6	85
PTAQ	1	38	1	44	1	23
SADO	1	44	1	33	1	31
SMST	2	25			1	23
STRO	1	6			1	8
SYRE	3	88	2	56	3	38
TRLA2	1	63	3	78	1	62
TROV			1	11		
VAHE	1	44	2	22	1	54
VISE	1	31	1	22	3	15
Total Herb Cover	27	100	24	100	21	92

ASSOCIATION	PSME/ SYMO		PSME-TSHE/ BENE		PSME-TSHE/ RHMA	
# OF PLOTS	7		26		14	
	Mean Relative Cover %	Con- stancy %	Mean Relative Cover %	Con- stancy %	Mean Relative Cover %	Constancy %
Mature Trees						
ABGR	6	43	4	12	3	43
ACMA	20	14	10	46		
ALRU					4	29
ARME	19	57	6	35	14	64
CACH			5	31	15	71
CADE	4	71	18	65	8	43
CONU	8	14	13	19	8	43
PILA			10	12		
PIMO			1	4		
PIPO			13	8		
PSME	72	100	67	100	56	100
TABR			1	4	4	14
THPL			18	12	12	21
TSHE	1	14	4	27	5	50
Total Tree Cover	85	100	81	100	74	100
Regenerating Trees						
ABGR	3	57	2	23	2	14
CADE	3	57	4	46	6	43
PILA			1	4	1	7
PIMO	1	14				
PIPO			1	8	2	7
PSME	2	86	2	81	4	50
TABR	1	14	1	4	1	7
THPL	1	14	6	15	1	14
TSHE	1	29	1	38	2	43
Shrubs						
ACCI	1	14	15	54	19	57
BEAQ	2	71	2	23		
BENE	6	100	26	100	13	100
CACH	1	14	6	23		
CHME	1	14	1	31	1	29
CHUM	1	14	6	38	2	43
COCO2	6	100	9	69	2	29

ASSOCIATION	PSME/ SYMO		PSME-TSHE/ BENE		PSME-TSHE/ RHMA	
# OF PLOTS	7		26		14	
	Mean Relative Cover %	Con- stancy %	Mean Relative Cover %	Con- stancy %	Mean Relative Cover %	Constancy %
CONU	2	43	2	35	1	36
GASH			13	35	39	100
HODI	13	71	5	46	4	36
LOCI	3	29	1	15	1	21
LOHI	3	29	1	4		
PAMY			2	8		
RHDI	3	43	1	27	1	7
RHMA					39	100
ROGY	6	86	3	69	2	86
RUPA	1	14	4	12	3	7
RUUR	2	100	1	73	1	86
SYMO	37	100	4	73	2	43
VAME	1	14	2	4		
VAPA	8	29	3	19	1	43
WHMO	7	57	5	58	4	79
Total Cover:						
High Shrubs	21	100	22	88	56	100
Low Shrubs	47	100	37	96	56	100
Herbs						
ACTR			4	69	3	43
ADBI	2	43	3	73	1	43
ANDE	1	57	2	58	1	43
ANLY2			1	4	1	7
ARMA3	1	43	1	42		
ASCA3	1	14	1	4	1	7
BRVU	2	43	1	23	1	7
CABU2	1	14	1	4		
CASC2	5	14	1	38	2	29
DIHO	1	43	2	42	1	50
FECA	15	14	2	15	1	7
FEOC	1	14	1	31		
FESU	2	29	1	12		
FRVE	2	71	2	50	1	29
GAOR			1	4	1	7
GATR	1	57	1	46	1	57
GOOB	1	57	1	65	1	43
HIAL	1	57	1	85	1	43

ASSOCIATION	PSME/ SYMO		PSME-TSHE/ BENE		PSME-TSHE/ RHMA	
# OF PLOTS	7		26		14	
	Mean Relative Cover %	Con- stancy %	Mean Relative Cover %	Con- stancy %	Mean Relative Cover %	Constancy %
IRTE	1	14	1	31	1	21
LIBO2	16	43	4	50	7	50
MOSI	1	14	1	19	2	14
OXOR			1	4		
POMU	11	57	6	77	7	64
PTAQ	2	43	3	27	2	50
SADO	1	71	3	12	1	7
SMST			2	15	2	7
STRO			1	4	1	14
SYRE	3	43	3	35	1	43
TRLA2	2	86	2	88	1	50
TROV	1	14	1	19	1	14
VAHE	1	57	1	27	1	29
VISE	1	14	2	46	2	50
XETE					2	29
Total Herb Cover	20	100	17	96	12	100

ASSOCIATION	PSME-TSHE/ GASH	
# OF PLOTS	26	
	Mean Relative Cover %	Con-stancy %
Mature Trees		
ABGR	3	19
ACMA	9	35
ARME	5	27
CACH	7	42
CADE	15	50
CONU	10	27
PILA	12	23
PIMO	5	4
PIPO	4	4
PSME	59	100
TABR	5	15
THPL	6	38
TSHE	9	65
Total Tree Cover	74	100
Regenerating Trees		
ABGR	3	19
CADE	5	42
PILA	1	8
PIMO	1	4
PSME	4	73
TABR	3	23
THPL	2	15
TSHE	2	46
Shrubs		
ACCI	21	73
BEAQ	3	8
BENE	9	96
CACH	3	19
CHME	1	23
CHUM	1	27
COCO2	8	65
CONU	5	35
GASH	61	100

ASSOCIATION	PSME-TSHE/ GASH	
# OF PLOTS	26	
	Mean Relative Cover %	Con-stancy %
HODI	12	58
LOCI	2	15
LOHI	2	15
PAMY	1	4
RHDI	6	19
RHMA	3	38
ROGY	2	88
RUPA	1	15
RUUR	2	81
SYMO	5	58
VAME	1	4
VAPA	3	54
WHMO	5	69
Total Cover:		
High Shrubs	41	100
Low Shrubs	58	96
Herbs		
ACTR	2	50
ADBI	2	50
ANDE	1	69
ANLY2	1	8
ARMA3	2	12
BRVU	1	23
CABU2	1	8
CASC2	1	23
CLUN	1	15
COLA	1	4
DIHO	1	42
FECA	1	8
FEOC	1	38
FESU	1	4
FRVE	1	38
GAOR	1	12
GATR	1	50
GOOB	1	58
HIAL	1	54
IRTE	1	19

ASSOCIATION	PSME-TSHE/ GASH
# OF PLOTS	26
	Mean Relative Cover % / Constancy %
LIBO2	6 / 81
MOSI	2 / 19
POMU	4 / 88
PTAQ	4 / 62
SADO	3 / 23
SMST	2 / 8
STRO	1 / 4
SYRE	2 / 35
TRLA2	2 / 58
TROV	1 / 19
VAHE	2 / 38
VISE	3 / 62
XETE	1 / 8
Total Herb Cover	14 / 96

ASSOCIATION	ABGR / ARUV		ABGR / BENE		ABGR / CHUM	
# OF PLOTS	2		18		16	
	Mean Relative Cover %	Con-stancy %	Mean Relative Cover %	Con-stancy %	Mean Relative Cover %	Constancy %
Mature Trees						
ABGR	2	50	14	100	17	83
ACMA			3	39	1	17
ARME			4	6		
CACH			5	17	2	17
CADE			17	67	7	17
CONU			7	28	2	17
PILA	5	50	4	33		
PIPO			11	11		
PSME	23	100	46	100	68	100
TABR			7	28		
THPL			43	11	4	17
TSHE			11	33	5	33
Total Tree Cover	23	100	79	100	81	100
Regenerating Trees						
ABAM					1	33
ABGR	2	100	7	89	9	100
CADE			5	39	3	17
PIMO			2	6	1	17
PIPO			1	6		
PSME			2	22	2	33
TABR			2	6	1	17
THPL			3	17		
TSHE			2	17	1	67
Shrubs						
ACCI	6	100	15	61	2	50
ACGLD			2	11		
ARUV	25	100				
BEAQ			3	28	1	50
BENE			31	100	15	100
CACH	5	50	2	11	3	67
CHME			1	22	1	50
CHUM	1	50	2	28	28	100
COCO2			7	67	7	33

ASSOCIATION	ABGR / ARUV		ABGR / BENE		ABGR / CHUM	
# OF PLOTS	2		18		16	
	Mean Relative Cover %	Con-stancy %	Mean Relative Cover %	Con-stancy %	Mean Relative Cover %	Constancy %
CONU			10	39	7	50
GASH			30	22		
HODI	2	100	8	44	3	67
LOCI			4	11		
PAMY	5	50	1	6	5	17
RHDI			2	11		
RHMA			1	6		
RILA			2	6		
ROGY			3	100	2	83
RUPA	2	50	1	11	1	33
RUUR			1	67	2	100
SYAL			5	6	1	33
SYMO			4	83	2	67
VAAL			1	6		
VAME			1	6	1	50
VAPA			1	6		
WHMO			4	72		
Total Cover:						
High Shrubs	13	100	27	94	11	100
Low Shrubs	25	100	42	89	39	100
Herbs						
ACTR	1	50	4	83	7	67
ADBI			2	72	1	50
ANDE			2	83	2	83
ANLY2			1	6		
ARMA3			1	22	1	33
ASCA3			1	17		
BRVU			8	28	1	83
CASC2			3	33	2	17
CLUN			1	17	2	33
COLA			3	17		
DIHO			2	83		
FECA			1	22		
FEOC			3	17	1	17
FRVE			2	50	1	67
GAOR			1	6		
GATR			1	39	1	17

ASSOCIATION	ABGR / ARUV		ABGR / BENE		ABGR / CHUM	
# OF PLOTS	2		18		16	
	Mean Relative Cover %	Con-stancy %	Mean Relative Cover %	Con-stancy %	Mean Relative Cover %	Constancy %
GOOB			1	61	1	100
HIAL			1	56	1	83
IRTE			2	6	1	17
LIBO2			10	78	47	67
MOSI			1	17		
OXOR			3	6		
POMU			3	72	1	17
PTAQ			8	11	2	50
PYSE					2	67
SADO			2	22	3	17
SMST			2	28	1	17
STRO			2	11	1	17
SYRE			2	50		
TITR			1	22		
TRLA2			2	67	1	67
TROV			1	33	1	50
VAHE			2	56		
VISE			2	56	6	33
XETE	1	50			1	17
Total Herb Cover	1	100	28	89	36	100

ASSOCIATION	TSHE/VAAL/ COCA		TSHE/ BENE		TSHE/BENE/ OXOR	
# OF PLOTS	13		179		47	
	Mean Relative Cover %	Con- stancy %	Mean Relative Cover %	Con- stancy %	Mean Relative Cover %	Constancy %
Mature Trees						
ABAM			1	3		
ABGR	2	23	4	8	10	4
ACMA	2	15	11	32	10	43
ALRU	2	8	5	3	3	4
ARME			2	3		
CACH			5	12		2
CADE	1	8	6	9		
CONU			5	16	8	11
PILA			6	2		
PIMO			3	3		
PSME	41	100	52	99	20	100
TABR	3	23	6	26	6	40
THPL	11	62	21	55	14	62
TSHE	46	100	33	88	23	96
Total Tree Cover	77	100	81	100	12	100
Regenerating Trees						
ABAM	1	31	1	7		
ABGR			2	10	1	4
CADE			2	3		
PILA			1	1		
PIMO			1	1		
PIPO			1	1		
PSME			2	14	5	9
TABR	5	46	3	35	3	19
THPL	2	46	5	47	7	38
TSHE	10	85	7	89	11	89
Shrubs						
ACCI	19	85	23	77	22	85
ACGLD	3	8	1	3		2
BEAQ			1	4		
BENE	9	85	31	100	17	100
CACH	1	15	3	30	2	11
CHME	1	46	1	42		19

ASSOCIATION	TSHE/VAAL/ COCA		TSHE/ BENE		TSHE/BENE/ OXOR	
# OF PLOTS	13		179		47	
	Mean Relative Cover %	Con- stancy %	Mean Relative Cover %	Con- stancy %	Mean Relative Cover %	Constancy %
CHUM	8	38	4	44	3	4
COCO2	2	8	4	29	4	26
CONU			5	25	3	26
GASH	9	23	5	56	13	76
HODI			3	9		4
LOCI			1	6		
LOHI			1	2		
PAMY	1	15	2	11		
RHDI			2	1		
RHMA	5	54	4	44	4	34
RIBR			1	1		
RILA			1	2		
ROGY	4	38	2	46	2	28
RUPA	1	8	2	11		9
RUSP	1	8				2
RUUR	1	69	1	72		53
SYMO	2	15	3	27	1	11
VAAL	17	62	2	5	1	6
VAME	2	54	1	16		2
VAOV	22	15				
VAPA	7	85	3	69	2	83
WHMO			3	25		13
Total Cover:						
High Shrubs	31	100	27	95	27	100
Low Shrubs	22	85	35	92	20	83
Herbs						
ACTR	5	62	2	54	16	47
ADBI	1	31	2	25	1	32
ANDE	1	23	2	52	1	40
ANLY2			1	3		
ARMA3			1	9		
ASCA3	2	15	2	17	1	19
ATFI	1	8	1	3		13
BLSP	3	23	2	3	1	19
BRVU			1	8		
CABU2	1	15	1	26		17
CASC2			1	12		13

ASSOCIATION	TSHE/VAAL/ COCA		TSHE/ BENE		TSHE/BENE/ OXOR	
# OF PLOTS	13		179		47	
	Mean Relative Cover %	Con- stancy %	Mean Relative Cover %	Con- stancy %	Mean Relative Cover %	Constancy %
CLUN	4	46	2	13	3	17
COCA	7	85	4	16		2
COLA	9	38	2	17	4	32
DIHO	1	54	1	25	1	49
FECA			1	5		
FEOC			1	7		
FESU	1	8	1	3		2
FRVE			2	8		2
GAOR	1	8	1	7	1	19
GATR	1	8	1	39	1	62
GOOB	1	62	1	50	3	23
HIAL	1	15	1	26		13
IRTE			1	7		2
LIBO2	16	100	9	74	13	47
MOSI			2	9	1	21
OXOR	40	15	3	13	20	100
POMU	6	69	11	82	17	100
PTAQ	2	46	2	35	1	19
PYSE	1	8	1	7		
SADO			1	1		
SMST	8	54	2	23	4	36
STRO	1	15	1	3		9
SYRE			2	14		6
TITR	4	92	2	30	2	53
TRLA2	1	8	2	46	1	26
TROV	1	54	1	63		64
VAHE	6	38	2	39	5	47
VISE	3	62	4	82	4	64
XETE	2	15	3	13		2
Total Herb Cover	33	85	21	92	19	83

ASSOCIATION	TSHE/BENE-GASH		TSHE/BENE-ACTR		TSHE/OPHO	
# OF PLOTS	96		44		47	
	Mean Relative Cover %	Constancy %	Mean Relative Cover %	Constancy %	Mean Relative Cover %	Constancy %
Mature Trees						
ABAM			2	9	2	31
ABGR	16	5	8	25	6	23
ACMA	11	45	8	20	1	23
ALRU	3	2	2	5	3	15
ARME	6	4	2	2		
CACH	4	16	4	7		
CADE	5	10	18	9		
CONU	10	32	15	16		
PILA	3	2	5	2		
PIMO	1	1	2	11		
PSME	53	100	56	100	29	92
TABR	6	24	11	27	10	15
THPL	16	56	20	36	25	54
TSHE	24	84	28	86	32	100
Total Tree Cover	77	100	76	100	64	100
Regenerating Trees						
ABAM	1	3	2	14	1	23
ABGR	5	9	3	36		
CADE	1	5	3	9		
PILA	1	2	1	2		
PIMO			1	2		
PSME	2	20	2	9	1	8
TABR	2	20	2	30	1	8
THPL	5	46	2	30	1	38
TSHE	8	88	6	89	4	100
Shrubs						
ACCI	25	90	22	86	36	69
ACGLD	5	2				
BEAQ	1	2	2	14		
BENE	29	100	31	100	12	31
CACH	2	25	3	43		
CHME	1	28	1	32	1	15
CHUM	2	41	5	57	4	15

ASSOCIATION	TSHE/BENE-GASH		TSHE/BENE - ACTR		TSHE/OPHO	
# OF PLOTS	96		44		47	
	Mean Relative Cover %	Con-stancy %	Mean Relative Cover %	Con-stancy %	Mean Relative Cover %	Constancy %
COCO2	5	42	5	41	2	31
CONU	4	38	6	36	3	8
GASH	34	100	30	16	5	31
HODI	2	8	2	5		
LOCI	1	5	1	9		
LOHI	1	1	1	2		
OPHO					28	100
PAMY			2	18		
RHMA	4	40	3	25	1	15
RIBR					2	23
RILA			3	9	1	8
ROGY	2	41	2	80	2	38
RUPA	2	8	1	14		
RUSP	1	2			2	54
RUUR	1	79	2	82	2	46
SYMO	3	22	3	57		
VAAL	2	4	1	2	5	15
VAME	1	8	4	27		
VAOV					4	8
VAPA	3	81	3	57	2	85
WHMO	4	40	5	18		
Total Cover:						
High Shrubs	37	97	33	95	49	92
Low Shrubs	56	85	37	91	16	92
Herbs						
ACTR	2	47	12	84	4	38
ADBI	1	35	2	66	1	54
ANDE	2	58	2	84	1	31
ANLY2	1	1	1	5		
ARMA3	1	4	1	14		
ASCA3	3	10	2	45	2	54
ATFI	1	1	2	9	10	85
BLSP			8	5	5	46
BRVU	1	6	1	18		
CABU2	1	14	1	5	1	31
CASC2	1	13	1	18	2	8
CLUN	3	15	3	52	3	46

ASSOCIATION	TSHE/BENE-GASH		TSHE/BENE - ACTR		TSHE/OPHO	
# OF PLOTS	96		44		47	
	Mean Relative Cover %	Constancy %	Mean Relative Cover %	Constancy %	Mean Relative Cover %	Constancy %
COCA	5	1	8	41	6	69
COLA	6	19	2	7	9	23
DIHO	1	31	1	48	2	31
FECA	1	6	1	7	1	8
FEOC	1	6	1	7		
FESU			1	7		
FRVE	1	7	1	18		
GAOR	2	10	1	11	1	8
GATR	1	51	1	50	2	54
GOOB	1	55	1	59	1	23
HIAL	1	28	1	25	1	15
IRTE	1	6	1	5		
LIBO2	11	70	11	73	4	46
MOSI	1	16	1	9	1	46
OXOR	11	20			40	31
POMU	9	86	5	66	8	85
PTAQ	3	36	2	52	1	23
PYSE			1	25	1	15
SADO		2	1	5		
SMST	1	20	3	61	6	77
STRO	1	5	1	9	1	38
SYRE	2	18	1	2		
TITR	2	18	6	75	15	100
TRLA2	2	46	1	57		
TROV	1	57	1	59	1	85
VAHE	2	41	3	50	6	62
VISE	4	75	4	84	2	54
XETE	1	10	1	2		
Total Herb Cover	21	85	37	91	64	100

ASSOCIATION	TSHE/ OXOR		TSHE/RHMA-VAAL/COCA		TSHE/RHMA/ XETE	
# OF PLOTS	66		11		39	
	Mean Relative Cover %	Con-stancy %	Mean Relative Cover %	Con-stancy %	Mean Relative Cover %	Constancy %
Mature Trees						
ABAM	3	3	1	18	2	13
ABGR	11	12	1	9	6	5
ACMA	13	62	5	9		
ALRU	7	9	2	9		
CACH					3	21
CONU	5	14			2	3
PILA					7	5
PIMO					2	10
PSME	42	97	43	100	38	100
TABR	6	20	10	27	7	10
THPL	20	64	19	73	12	56
TSHE	32	95	30	100	34	100
Total Tree Cover	78	15	72	100	68	100
Regenerating Trees						
ABAM	2	2	1	18	2	15
ABGR	3	6			3	10
PIMO					1	3
PSME	1	8			1	10
TABR	2	17	8	64	2	33
THPL	2	45	3	36	2	46
TSHE	7	83	11	73	7	92
Shrubs						
ACCI	25	82	26	64	18	54
ACGLD	1	2	2	18	9	8
BEAQ	1	2				
BENE	5	85	10	100	9	97
CACH	1	9	2	18	3	46
CHME	1	3	2	55	1	33
CHUM	3	5	4	64	3	69
COCO2	5	23			1	5
CONUE	3	18	1	18	2	5
GASH	7	47	3	18	22	49
HODI					1	8

ASSOCIATION	TSHE/ OXOR		TSHE/RHMA-VAAL/COCA		TSHE/RHMA/ XETE	
# OF PLOTS	66		11		39	
	Mean Relative Cover %	Con-stancy %	Mean Relative Cover %	Con-stancy %	Mean Relative Cover %	Constancy %
LOCI	1	5				
LOHI			1	9		
PAMY			2	27	3	44
RHMA	2	12	30	100	52	100
ROGY	3	20	1	55	1	28
RUPA	1	6	1	9		
RUSP	2	12				
RUUR	2	70	1	64	1	44
SYMO	2	6			2	8
VAAL	2	2	17	82	9	38
VAME	3	8	3	45	2	46
VAOV	1	2	1	9		
VAPA	1	88	4	91	3	87
WHMO	5	5			1	8
Total Cover:						
High Shrubs	28	92	50	100	62	100
Low Shrubs	11	91	23	91	28	79
Herbs						
ACTR	4	38	3	64	2	26
ADBI	1	39	1	27	1	3
ANDE	1	23	1	36	1	21
ANLY2	1	2			1	3
ARMA3	2	3			1	3
ASCA3	2	24				
ATFI	5	30				
BLSP	2	33				
BRVU	1	9			1	3
CABU2	1	8	1	9	1	10
CASC2	2	8			1	10
CLUN	1	9	3	55	1	5
COCA	6	8	11	91	1	13
COLA	6	20	4	36	3	15
DIHO	2	61	1	64	1	3
FECA	2	6				
FEOC					1	3
FESU	1	2				
FRVE	1	5				

ASSOCIATION	TSHE/ OXOR		TSHE/RHMA-VAAL/COCA		TSHE/RHMA/ XETE	
# OF PLOTS	66		11		39	
	Mean Relative Cover %	Con-stancy %	Mean Relative Cover %	Con-stancy %	Mean Relative Cover %	Constancy %
GAOR	1	9			1	3
GATR	2	68	1	9	1	8
GOOB	1	14	1	55	1	64
HIAL	1	11	1	18	1	21
IRTE	1	2			1	3
LIBO2	6	44	22	91	8	85
MOSI	2	24	1	9		
OXOR	52	100	11	18	2	3
POMU	30	98	4	36	2	31
PTAQ	1	33	1	18	1	10
PYSE			1	9	1	3
SMST	3	41	4	45	1	8
STRO	1	18	1	9	1	3
SYRE	1	5			1	8
TITR	2	59	3	64	1	3
TRLA2	1	23	2	18	1	23
TROV	1	67	1	55	1	21
VAHE	5	64	1	27	1	10
VISE	3	50	6	55	2	31
XETE	2	2	1	36	19	100
Total Herb Cover	76	92	31	91	22	77

ASSOCIATION	TSHE/RHMA-BENE		TSHE/RHMA/OXOR		TSHE/RHMA-GASH	
# OF PLOTS	86		13		72	
	Mean Relative Cover %	Constancy %	Mean Relative Cover %	Constancy %	Mean Relative Cover %	Constancy %
Mature Trees						
ABAM	1	8	1	15		
ABGR	7	8	6	8	3	10
ACMA	2	13	1	8	3	10
ARME	3	1			2	3
CACH	4	13	4	8	12	32
CADE	6	9			9	24
CONU	4	15	1	8	6	24
PILA	8	2			6	19
PIMO	9	5			4	7
PIPO					5	1
PSME	46	100	40	100	47	100
TABR	8	34	5	23	8	31
THPL	18	66	13	54	16	60
TSHE	34	99	40	100	25	86
Total Tree Cover	78	100	77	100	73	100
Regenerating Trees						
ABAM	1	8	1	15	1	1
ABGR	2	10	4	8	3	7
CADE					1	13
PIMO	1	1			1	4
PSME	1	7			2	15
TABR	4	44	2	31	3	26
THPL	4	53	4	38	5	36
TSHE	6	93	6	100	6	85
Shrubs						
ACCI	14	70	18	92	16	71
ACGLD	4	3				
BEAQ					1	1
BENE	25	100	16	69	16	96
CACH	2	43	2	15	6	35
CHME	1	57	2	38	1	31
CHUM	4	71	5	31	3	58
COCO2	3	9	4	15	4	10

ASSOCIATION	TSHE/RHMA-BENE		TSHE/RHMA/OXOR		TSHE/RHMA-GASH	
# OF PLOTS	86		13		72	
	Mean Relative Cover %	Con-stancy %	Mean Relative Cover %	Con-stancy %	Mean Relative Cover %	Constancy %
CONU	2	7	1	8	2	19
GASH	8	59	9	46	46	100
HODI			3	15	2	4
LOCI	1	3			1	4
LOHI	2	1				
OPHO			1	8		
PAMY	1	20			3	15
RHMA	35	100	34	100	42	100
ROGY	2	27	2	31	2	44
RUPA	1	3				
RUSP	1	1				
RUUR	1	56	2	15	1	54
SYMO	2	14	3	38	2	14
VAAL	3	9			2	4
VAME	1	23	7	15	1	8
VAPA	3	73	4	69	3	64
WHMO	1	14			4	26
Total Cover:						
High Shrubs	46	100	44	100	63	100
Low Shrubs	30	90	25	77	55	78
Herbs						
ACTR	2	38	4	77	2	26
ADBI	1	8	1	23	1	18
ANDE	1	37	1	38	1	38
ANLY2			1	8	1	3
ASCA3	1	2	4	15		
BLSP	1	1	1	8		
BRVU	1	1			1	6
CABU2	1	15	1	8	1	11
CASC2	2	1	2	8	1	6
CLUN	1	9	2	15	1	8
COCA	3	22	4	15	2	4
COLA	5	23	5	69	2	11
DIHO	1	16	1	31	1	19
FECA					1	1
FEOC	2	1			1	1
FESU	1	1			1	3

ASSOCIATION	TSHE/RHMA-BENE		TSHE/RHMA/OXOR		TSHE/RHMA-GASH	
# OF PLOTS	86		13		72	
	Mean Relative Cover %	Constancy %	Mean Relative Cover %	Constancy %	Mean Relative Cover %	Constancy %
FRVE	1	2			1	4
GAOR			1	8	3	3
GATR	1	13	1	15	1	17
GOOB	1	70	1	31	1	63
HIAL	1	17	1	8	1	15
IRTE					1	3
LIBO2	8	87	3	54	8	75
MOSI	1	5	2	15	1	6
OXOR	4	7	37	100	2	3
POMU	4	57	6	92	4	43
PTAQ	1	17	1	23	2	26
PYSE	1	5				
SADO					1	3
SMST	1	13	4	54	1	7
STRO	1	2	1	15	1	3
SYRE	1	5	1	15	1	11
TITR	2	30	5	62	1	10
TRLA2	1	22	1	8	2	40
TROV	1	64	1	77	1	26
VAHE	2	16	2	38	1	18
VISE	2	77	1	46	2	64
XETE	3	36	2	31	5	42
Total Herb Cover	14	90	45	77	9	78

ASSOCIATION	TSHE/RHMA / LIBO2		TSHE/ GASH		TSHE/ POMU	
# OF PLOTS	13		42		18	
	Mean Relative Cover %	Con-stancy %	Mean Relative Cover %	Con-stancy %	Mean Relative Cover %	Constancy %
Mature Trees						
ABAM	1	23	11	5		
ABGR	5	15	10	48		
ACMA			2	5	17	67
ARLU			5	5		
ARME			13	17		
CACH			16	12		
CADE	5	8	10	26	5	22
CONU			1	2		
PILA	7	23				
PIMO	5	31				
PIPO	3	8				
PSME	41	92	54	100	46	100
TABR	5	38	12	10		
THPL	25	62	17	40	19	50
TSHE	34	92	22	81	37	100
Total Tree Cover	75	100	75	100	84	100
Regenerating Trees						
ABAM	1	8				
ABGR	15	8	3	14		
CADE	1	8	3	14		
PIMO			1	2		
PSME	1	8	4	29		
TABR	3	46	2	17	2	22
THPL	6	46	5	31	3	39
TSHE	6	85	7	86	4	94
Shrubs						
ACCI	8	62	29	90	15	83
ACGLD	5	8				
BEAQ			1	2		
BENE	8	92	9	93	6	78
CACH	1	38	3	21	1	6
CHME	1	23	1	14	2	28
CHUM	3	85	4	31	1	11

ASSOCIATION	TSHE/RHMA / LIBO2		TSHE / GASH		TSHE / POMU	
# OF PLOTS	13		42		18	
	Mean Relative Cover %	Constancy %	Mean Relative Cover %	Constancy %	Mean Relative Cover %	Constancy %
COCO2	2	15	4	67	3	11
CONU	1	8	9	43	4	28
GASH	7	46	54	100	4	67
HODI			4	12		
LOCI	1	8	1	5		
LOHI			2	2		
PAMY	2	31				
RHDI			1	2		
RHMA	36	100	6	36	2	11
ROGY	2	38	2	62	1	17
RUPA	2	8	3	14	1	6
RUSP			1	2		
RUUR	1	77	2	79	1	67
SYMO	5	8	3	40		
VAAL	6	31	5	2	2	6
VAME	2	69	1	7		
VAPA	5	77	4	79	2	67
WHMO	2	8	4	38	3	6
Total Cover:						
High Shrubs	43	100	46	100	21	83
Low Shrubs	11	92	67	83	6	89
Herbs						
ACTR	4	46	3	36	1	33
ADBI	1	23	2	48	1	22
ANDE	1	62	2	71	1	28
ANLY2	1	8				
ARMA3	1	8			1	6
ASCA3			2	14	7	28
ATFI			1	2	1	6
BLSP					3	28
BRVU			1	5		
CABU2	1	15	1	7	1	17
CASC2	1	8	1	10	1	11
CLUN	2	15	5	12	5	6
COCA	3	38				
COLA	3	46	3	7	3	11
DIHO	1	31	1	43	1	50

ASSOCIATION	TSHE/RHMA/ LIBO2		TSHE/ GASH		TSHE/ POMU	
# OF PLOTS	13		42		18	
	Mean Relative Cover %	Con- stancy %	Mean Relative Cover %	Con- stancy %	Mean Relative Cover %	Constancy %
FECA			1	12	1	11
FESU			1	2		
FRVE	1	8	1	14		
GAPR	5	8	1	17		
GAOR	1	23	2	60	1	61
GOOB	1	77	1	33	3	11
HIAL	1	31	1	21		
IRTE			1	5		
LIBO2	24	100	15	50	1	44
MOSI	1	8	1	12	1	28
OXOR	3	8	7	26	5	56
POMU	3	46	9	74	36	100
PTAQ	1	31	6	60	1	17
PYSE	1	31				
SADO	2	8	1	7		
SMST	5	15	2	14	2	17
STRO	1	15	1	7	1	11
SYRE	1	8	3	5	1	6
TITR	1	62	2	12	2	39
TRLA2	1	31	3	52	1	6
TROV	1	92	1	50	1	83
VAHE	2	8	2	38	2	28
VISE	3	85	2	71	3	72
XETE	1	23	2	5		
Total Herb Cover	39	92	19	83	41	89

ASSOCIATION	TSHE/ LIBO2		TSHE/ ACTR	
# OF PLOTS	14		31	
	Mean Relative Cover %	Con- stancy %	Mean Relative Cover %	Con- stancy %
Mature Trees				
ABAM	3	7	2	19
ABGR			4	23
ACMA	24	29	6	10
ALRU	5	7		
CACH	1	7	1	3
CADE	15	7	12	13
CONU			12	6
PIMO	1	7	2	3
PSME	40	100	56	100
TABR	3	7	8	26
THPL	19	86	19	52
TSHE	23	86	30	90
Total Tree Cover	76	100	78	100
Regenerating Trees				
ABAM	1	21	1	19
ABGR	6	14	1	26
CADE	15	7	5	6
PIMO	1	7	1	3
PSME	1	14	2	13
TABR	2	50	2	39
THPL	3	64	2	35
TSHE	9	93	8	87
Shrubs				
ACCI	13	71	16	90
BEAQ			1	6
BENE	3	93	5	90
CACH	2	36	2	19
CHME	1	36	1	32
CHUM	3	64	5	48
COCO2	2	7	5	35
CONU	2	14	9	29
GASH	1	14	3	23
LOCI	1	7		

ASSOCIATION	TSHE/ LIBO2		TSHE/ ACTR	
# OF PLOTS	14		31	
	Mean Relative Cover %	Con- stancy %	Mean Relative Cover %	Con- stancy %
LOHI	1	7		
OPHO			1	6
PAMY	2	31	2	13
RHMA	3	43	4	35
RILA	1	7	2	10
ROGY	5	36	2	19
RUPA	5	21	1	19
RUSP	1	7	1	3
RUUR	1	64	1	71
SYMO	3	21	6	58
VAAL	5	14	2	13
VAME	1	21	2	39
VAOV			1	3
VAPA	3	93	3	68
WHMO	3	79	4	6
Total Cover:				
High Shrubs	19	100	22	97
Low Shrubs	6	79	13	97
Herbs				
ACTR	2	36	15	90
ADBI	1	36	5	74
ANDE	2	57	2	74
ANLY2			1	6
ARMA3	1	7	1	10
ASCA3			2	55
ATFI			1	13
BLSP			8	6
BRVU			2	19
CABU2	2	7	1	3
CASC2	3	14	2	32
CLUN	1	7	3	52
COCA	4	29	8	61
COLA	5	21	4	19
DIHO	3	36	1	45
FECA	1	7		
FEOC			1	3
FESU			1	16

ASSOCIATION	TSHE/ LIBO2		TSHE/ ACTR	
# OF PLOTS	14		31	
	Mean Relative Cover %	Con- stancy %	Mean Relative Cover %	Con- stancy %
FRVE			2	39
GAOR			1	26
GATR	2	36	1	58
GOOB	2	79	1	74
HIAL	1	36	1	32
IRTE			2	6
LIBO2	23	100	8	77
MOSI	1	14	1	10
OXOR	5	7		
POMU	5	71	4	68
PTAQ	1	36	4	52
PYSE	1	7	1	19
SADO			2	13
SMST	3	14	6	74
STRO	1	14	1	3
SYRE	1	14	1	3
TITR	2	43	12	84
TRLA2	3	50	2	39
TROV	1	79	1	48
VAHE	1	43	4	65
VISE	6	71	5	94
XETE	1	21	1	3
Total Herb Cover	30	79	50	97

APPENDIX II

Mean relative percent cover (average cover for all plots in which the species occurs) and percent constancy for selected trees, shrubs and herbs of the Pacific silver fir and mountain hemlock zone plant associations.

ASSOCIATION	ABAM-ABGR/ SMST		ABAM/VAAL/ COCA		ABAM/VAAL- GASH	
# OF PLOTS	40		13		3	
	Mean Relative Cover %	Con- stancy %	Mean Relative Cover %	Con- stancy %	Mean Relative Cover %	Constancy %
Mature Trees						
ABAM	12	88	18	13	8	100
ABGR	11	13				
ABLA2	6	5				
ABPR	23	40	8	31	1	67
CACH						
CHNO2	3	5				
PICO	1	3				
PIEN						
PIMO	3	33	4	15		
PSME	28	95	19	100	26	100
TABR	15	3	3	8		
THPL			5	15	15	100
TSHE	11	12	11	69	20	100
TSME	8	18	20	31		
Total Tree Cover	61	100	60	100	75	100
Regenerating Trees						
ABAM	11	98	19	100	18	67
ABCO						
ABLA2	15	3				
CHNO2						
PIMO	2	8				
PSME	3	13	2	8		
TABR	5	3				
THPL			3	15	3	67
TSHE	4	50	8	77	3	67
TSME	3	18	2	8		

ASSOCIATION	ABAM-ABGR/ SMST		ABAM/VAAL/ COCA		ABAM/VAAL-GASH	
# OF PLOTS	40		13		3	
	Mean Relative Cover %	Con-stancy %	Mean Relative Cover %	Con-stancy %	Mean Relative Cover %	Constancy %
Shrubs						
ACCI	23	38	15	77	20	33
ACGLD	3	10				
ALSI						
BENE	5	35	3	46	5	33
CACH	2	8	4	8	2	67
CHME	2	48	1	54	1	67
CHUM	8	73	7	85	4	67
COCO2	5	3				
GAOV	6	10	2	3	3	67
GASH					9	100
HODI	4	10				
MEFE			2	8		
OPHO	1	3				
PAMY	3	28	4	31		
RHAL						
RHMA	22	10	6	62	12	100
ROGY	6	50	2	31	2	33
RUUR	3	35	3	69		
SOSI	2	5	1	8		
SYMO	7	45				
VAAL	7	8	21	100	23	100
VAME	9	68	6	62		
VAOV	4	8	11	15	10	33
VAPA	2	3	2	23	6	100
VASC						
WHMO						
Total Cover:						
High Shrubs	30	75	24	100	23	100
Low Shrubs	21	50	10	23	38	100

ASSOCIATION	ABAM-ABGR/ SMST		ABAM/VAAL/ COCA		ABAM/VAAL-GASH	
# OF PLOTS	40		13		3	
	Mean Relative Cover %	Con-stancy %	Mean Relative Cover %	Con-stancy %	Mean Relative Cover %	Constancy %
Herbs						
ACRU	3	53				
ACTR	13	83	9	77		
ADBI	5	65	5	8		
ANDE	6	60	2	23		
ASCA3	6	53	3	8		
CASC2	5	58				
CLUN	8	73	9	85		
COCA	12	25	13	92	8	100
COLA			5	15		
DIHO	6	28	1	15		
GAOR	5	60	4	8		
GATR	4	53				
GYDR			2	8		
LIBO2	8	20	12	69	15	33
MOSI	12	28				
PERA	2	13	5	38	2	33
POMU	3	15	2	15		
PTAQ	8	40	5	31		
PYSE	4	63	2	46	3	33
SMST	22	100	3	31	3	33
STRO	5	3	5	8		
SYRE	3	5				
TITR	8	48	3	46	1	33
TRLA2	3	33				
TROV	2	60	2	85	2	67
VAHE	4	33	2	15		
VASI	2	15				
VERAT	1	10				
VISE	4	40	3	54		
XETE	14	45	10	38		
Total Herb Cover	67	100	48	100	27	100

ASSOCIATION	ABAM/VAME/ XETE		ABAM/VAME/ CLUN		ABAM/RHAL/ XETE	
# OF PLOTS	24		22		2	
	Mean Relative Cover %	Con- stancy %	Mean Relative Cover %	Con- stancy %	Mean Relative Cover %	Constancy %
Mature Trees						
ABAM	28	96	25	100	45	100
ABLA2			25	5		
ABPR	14	67			5	100
CACH			19	55		
CHNO2					5	50
PIMO	4	33	4	18		
PSME	22	67	25	73	5	50
THPL	4	013				
TSHE	19	54	14	50	5	50
TSME	8	58	11	50	20	50
Total Tree Cover	62	100	62	100	60	100
Regenerating Trees						
ABAM	22	100	18	100	11	100
CHNO2					5	50
PIMO	1	13	1	5		
PSME	1	4	2	5		
TABR	5	4	1	5		
THPL	2	4				
TSHE	3	33	5	36	6	50
TSME	2	33	8	23	4	100
Shrubs						
ACCI			10	27		
BENE	4	17	2	23		
CACH	1	4	1	5		
CHME	2	21	2	50		
CHUM	5	25	6	73		
GAOV	2	13	5	5		
PAMY	2	8	3	23		
RHAL					30	100

ASSOCIATION	ABAM/VAME/ XETE		ABAM/VAME/ CLUN		ABAM/RHAL/ XETE	
# OF PLOTS	24		22		2	
	Mean Relative Cover %	Con- stancy %	Mean Relative Cover %	Con- stancy %	Mean Relative Cover %	Constancy %
RHMA	13	29	3	18	50	50
ROGY	3	13	4	23		
RUUR	2	13	3	32		
SOSI	2	8	2	18	2	50
SYMO	3	4	2	14		
VAAL			3	9		
VAME	16	96	18	100	18	100
VAOV	4	17	6	18		
VAPA	3	13				
VASC	2	8				
Total Cover:						
High Shrubs	29	88	33	91	85	100
Low Shrubs	21	17	14	23		
Herbs						
ACTR	3	50	8	77		
ADBI			2	18		
ANDE	2	21	4	23		
CASC2	3	13	3	9		
CLUN	4	67	8	91	5	100
COCA	9	25	3	55		
COLA	1	4				
GAOR			2	5		
GATR	1	4				
LIBO2	8	13	7	18		
PERA	2	33	27	18		
POMU	2	4				
PTAQ	1	4	2	18		
PYSE	5	54	4	82		
SMST	1	4	3	32		
STRO	1	4	1	14		
SYRE	1	4				
TITR	1	8	3	36		
TRLA			4	9		
TROV	2	25	2	73	2	50
VASI			2	14		
VEVI			3	5		
VISE	2	17	4	36		
XETE	37	92	4	50	68	100
Total Herb Cover	41	100	39	100	88	100

ASSOCIATION	ABAM/RHAL/ CLUN		ABAM/ TITR		ABAM/ OPHO	
# OF PLOTS	5		59		21	
	Mean Relative Cover %	Con- stancy %	Mean Relative Cover %	Con- stancy %	Mean Relative Cover %	Constancy %
Mature Trees						
ABAM	33	80	16	97	20	95
ABGR			10	3	4	10
ABLA2						
ABPR	33	40	18	59	8	29
CACH						
CHNO2	5	40	10	2	18	10
PICO						
PIEN						
PIMO			3	20		
PSME	10	40	30	81	25	81
TABR			1	2	8	10
THPL			9	7	11	19
TSHE	12	80	15	75	16	90
TSME	7	60	6	24	3	10
Total Tree Cover	53	100	64	100	60	100
Regenerating Trees						
ABAM	14	100	20	100	13	100
ABCO						
ABLA2						
CHNO2	3	60			2	5
PIMO			1	2		
PSME						
TABR			22	3	14	19
THPL			6	7	4	19
TSHE	4	60	8	64	9	76
TSME			3	14	2	5

ASSOCIATION	ABAM/RHAL/ CLUN		ABAM/ TITR		ABAM/ OPHO	
# OF PLOTS	5		59		21	
	Mean Relative Cover %	Con- stancy %	Mean Relative Cover %	Con- stancy %	Mean Relative Cover %	Constancy %
Shrubs						
ACCI			5	29	21	52
ALSI					11	5
BENE	8	20	10	46	5	29
CACH			3	5		
CHME	2	20	2	41	2	29
CHUM			9	69	5	33
COCO2			3	2		
GAOV			4	8	2	10
MEFE			5	2		
OPHO	1	20			35	100
PAMY	1	20	4	19		
RHAL	17	100				
RHMA	53	40	12	24	6	19
ROGY			3	44	2	14
RUUR			4	39	2	43
SOSI	3	40	3	12		
SYMO			4	24	2	5
VAAL	30	40	13	12	16	33
VAME	24	100	8	78	7	52
VAOV	5	20	6	12	9	29
VAPA			3	17	2	19
VASC			1	2		
Total Cover:						
High Shrubs	69	100	31	83	55	100
Low Shrubs			24	29	32	14
Herbs						
ACRU			3	14	2	38
ACTR	3	60	14	97	14	86
ADBI			5	39	6	43
ANDE	3	20	3	36	3	38
ARLA			2	3		
ASCA			5	44	6	71
ATFI			5	7	18	67
BLSP			41	3	10	5
CASC2			3	24	2	10
CLUN	11	100	9	85	10	86

ASSOCIATION	ABAM/RHAL/ CLUN		ABAM/ TITR		ABAM/ OPHO	
# OF PLOTS	5		59		21	
	Mean Relative Cover %	Con- stancy %	Mean Relative Cover %	Con- stancy %	Mean Relative Cover %	Constancy %
COCA	7	80	16	54	12	76
COLA			18	3	5	19
DIHO			6	22	6	48
GAOR			7	44	5	29
GATR			3	24	3	38
GYDR					6	14
LIBO2	6	60	16	42	8	33
MOSI			6	15	9	33
OXOR			4	2	45	10
PERA			10	15	4	5
POMU			3	15	5	48
PTAQ			4	32	3	19
PYSE	3	40	4	66	2	33
SMST	2	20	8	86	25	90
STRO	1	20	7	7	7	24
SYRE			1	3		
TITR	4	40	10	88	16	86
TRCA3			1	2		
TRLA			4	19	3	19
TROV	2	20	2	63	2	57
VAHE			6	27	15	24
VASI			4	8	9	10
VERAT			1	3	2	14
VEVI			3	2		
VICIA			2	2		
VISE	2	20	4	49	4	33
XETE	25	40	11	41	2	5
Total Herb Cover	46	100	67	100	78	100

ASSOCIATION	ABAM/ BENE		ABAM/ MEFE		ABAM/ OXOR	
# OF PLOTS	58		9 (Mt. Hood Plots)		17	
	Mean Relative Cover %	Constancy %	Mean Relative Cover %	Constancy %	Mean Relative Cover %	Constancy %
Mature Trees						
ABAM	15	83	31	89	19	88
ABGR	8	2				
ABPR	14	22	13	22	18	35
CACH	5	2			4	6
CHNO2					15	6
PICO			5	11		
PIMO	4	29	1	11	5	6
PSME	29	100	13	67	35	100
TABR	9	22			10	6
THPL	12	21	15	44	13	24
TSHE	20	97	14	89	14	88
TSME	4	7	10	67	7	18
Total Tree Cover	67	100	59	100	70	100
Regenerating Trees						
ABAM	14	93	15	89	13	94
PIMO	2	5	3	11		
PSME	3	9	1	11	1	6
TABR	10	21			5	6
THPL	4	17	4	33	7	18
TSHE	12	88	5	89	6	94
TSME	3	5	4	33	3	12
Shrubs						
ACCI	16	52	6	22	15	41
ACGLD	1	2				
BENE	17	98	3	11	5	47
CACH	4	33	5	11		
CHME	2	36			2	41
CHUM	10	88			11	29
COCO2	2	3				6

ASSOCIATION	ABAM/ BENE		ABAM/ MEFE		ABAM/ OXOR	
# OF PLOTS	58		9 (Mt. Hood Plots)		17	
	Mean Relative Cover %	Con- stancy %	Mean Relative Cover %	Con- stancy %	Mean Relative Cover %	Constancy %
GAOV	5	21	7	33	3	6
MEFE			22	89		
OPHO			3	22	3	18
PAMY	5	55	2	11	1	18
RHAL	4	2				
RHMA	14	40	20	44	32	35
ROGY	4	41	1	11	3	6
RUUR	3	67	5	11	3	59
SOSI	2	2	1	56		
SYMO	3	19			2	12
VAAL	10	26	17	56	19	47
VAME	7	67	21	89	7	29
VAOV	4	7	28	67	2	12
VAPA	4	31			4	41
VASC	5	3	10	11		
WHMO	3	5				
Total Cover:						
High Shrubs	37	98	65	100	31	82
Low Shrubs	33	24	42	33	19	29
Herbs						
ACRU	1	2				
ACTR	8	78	11	56	10	71
ADBI	1	16			1	29
ANDE	1	26	3	11	2	35
ARLA			7	11		
ASCA	2	14	2	22	4	24
ATFI			3	33		
BLSP	4	2	9	22	15	6
CASC2	8	2			4	18
CLUN	5	47	15	56	5	53
COCA	12	62	10	78	8	47
COLA	3	7			5	35
DIHO	1	9			2	18
GAOR	2	2			2	12
GATR	2	10	1	11	3	12
LIBO2	14	67	3	33	8	41
MOSI	4	2			3	29
OXOR					38	100

ASSOCIATION	ABAM/ BENE		ABAM/ MEFE		ABAM/ OXOR	
# OF PLOTS	58		9 (Mt. Hood Plots)		17	
	Mean Relative Cover %	Con- stancy %	Mean Relative Cover %	Con- stancy %	Mean Relative Cover %	Constancy %
PERA	6	10	3	22	2	12
POMU	3	22			2	65
PTAQ	3	12	1	11	6	12
PYSE	3	66	2	22	2	24
SMST	3	34	2	33	7	76
STRO	5	3	4	44	1	6
TITR	4	38	4	56	5	88
TRLA	5	21	2	11	3	6
TROV	2	67	1	56	2	82
VAHE	2	10	1	11	2	24
VASI			4	33		
VEVI			2	11		
VISE	5	36			5	47
XETE	8	100	17	89	1	24
Total Herb Cover	43	100	41	100	61	100

ASSOCIATION	ABAM/RHMA-VAAL/COCA		ABAM/RHMA/XETE		ABAM/RHMA-BENE	
# OF PLOTS	18		48		12	
	Mean Relative Cover %	Constancy %	Mean Relative Cover %	Constancy %	Mean Relative Cover %	Constancy %
Mature Trees						
ABAM	15	89	16	43	12	75
ABGR					8	17
ABPR	11	33	8	38	11	42
CACH			3	6	5	8
PIMO	4	11	4	31	2	42
PSME	25	100	26	45	31	100
TABR	2	6	2	4	2	8
THPL	9	17	5	15	16	33
TSHE	20	83	22	88	21	83
TSME	45	6	9	29	5	25
Total Tree Cover	57	18	61	100	65	100
Regenerating Trees						
ABAM	21	100	15	96	9	100
CHNO2	3	6				
PIMO			2	8		
PSME			5	2		
TABR	3	11	2	2	2	8
THPL	5	6	2	15	8	25
TSHE	5	61	6	73	9	58
TSME			3	13	4	17
Shrubs						
ACCI	12	22	11	27	18	33
ACGLD	10	6	3	4		
BENE	5	78	7	60	10	92
CACH	1	6	4	13	5	8
CHME	2	44	2	23	2	25
CHUM	5	67	4	58	5	83
GAOV	11	22	7	40	6	33

ASSOCIATION	ABAM/RHMA-VAAL/COCA		ABAM/RHMA/XETE		ABAM/RHMA-BENE	
# OF PLOTS	18		48		12	
	Mean Relative Cover %	Con-stancy %	Mean Relative Cover %	Con-stancy %	Mean Relative Cover %	Constancy %
HODI			3	2		
OPHO			1	2		
PAMY	3	11	3	38	6	42
RHMA	65	100	53	100	62	100
ROGY	10	6	3	8	2	25
RUUR	4	72	3	35	4	33
SOSI	1	17	2	6		
SYMO			4	2	3	8
VAAL	16	72	16	46		
VAME	7	50	8	69	3	50
VAOV	15	28	4	15		
VAPA	2	28	4	31	8	33
VASC			1	4		
Total Cover:						
High Shrubs	74	100	67	100	73	100
Low Shrubs	28	1	15	2	32	25
Herbs						
ACTR	4	61	4	21	11	25
ADBI					3	8
ANDE			2	13	2	17
BLSP	1	6				
CASC2			3	4	1	8
CLUN	8	67	5	25	5	33
COCA	13	89	6	38	6	42
COLA	10	17	3	6		
DIHO					3	8
DRAU2			1	2		
GAOR			3	4		
GYDR			2	2		
LIBO2	8	72	7	58	15	50
OXOR			1	2		
PERA	13	33	9	21	1	8
POMU	1	6				
PTAQ	2	6	4	4	6	17
PYSE	2	28	2	25	3	25
SMST	3	17	7	6	1	17
TITR	2	22	4	8	1	8
TRLA			8	4		

ASSOCIATION	ABAM/RHMA-VAAL/COCA		ABAM/RHMA/XETE		ABAM/RHMA-BENE	
# OF PLOTS	18		48		12	
	Mean Relative Cover %	Con-stancy %	Mean Relative Cover %	Con-stancy %	Mean Relative Cover %	Constancy %
TROV	2	44	2	31	2	33
VAHE	3	11	2	4	4	8
VISE	2	44	2	10	4	17
XETE	6	67	23	100	6	17
Total Herb Cover	37	100	38	100	21	100

ASSOCIATION	ABAM-TSHE/ RHMA-GASH		ABAM/ACCI/ TITR		TSME/VAME/ XETE	
# OF PLOTS	5		21		42	
	Mean Relative Cover %	Con-stancy %	Mean Relative Cover %	Con-stancy %	Mean Relative Cover %	Constancy %
Mature Trees						
ABAM	16	80	13	100	14	76
ABGR			3	5		
ABLA2					8	5
ABPR			16	62	16	55
CACH	5	40	1	5		
CHNO2					15	2
PICO					6	17
PIMO	1	60	2	5	4	45
PSME	29	100	35	95	11	48
TABR			10	5		
THPL	7	80				
TSHE	23	100	14	67	7	5
TSME			10	33	33	98
Total Tree Cover	12	100	65	100	51	98
Regenerating Trees						
ABAM	6	100	9	95	14	93
ABLA2					4	21
CHNO2					3	5
PIMO					4	14
PSME			2	10	2	5
TABR			6	10		
THPL	2	40				
TSHE	8	80	6	62	2	14
TSME			5	19	9	76
Shrubs						
ACCI	30	20	31	95	5	2
BENE	23	60	13	33	2	10
CACH	5	40	2	10	4	2
CHME	2	40	1	38	1	12

ASSOCIATION	ABAM-TSHE/ RHMA-GASH		ABAM/ACCI/ TITR		TSME/VAME/ XETE	
# OF PLOTS	5		21		42	
	Mean Relative Cover %	Con-stancy %	Mean Relative Cover %	Con-stancy %	Mean Relative Cover %	Constancy %
CHUM	4	60	10	76	3	33
COCO2			5	10		
GAOV	1	20			2	21
GASH	30	100				
HODI			5	5		
PAMY	3	60	4	24	5	7
RHMA	62	100	15	24	6	31
ROGY			6	43	4	10
RUUR			4	57	4	7
SOSI					2	7
SYMO			6	33		
VAAL	1	20	9	43		
VAME	2	20	7	71	21	100
VAOV	4	60	2	5	4	2
VAPA			5	5	4	2
VASC			15	5	2	21
Total Cover:						
High Shrubs	72	100	48	100	34	83
Low Shrubs	80	40	28	14	27	17
Herbs						
ACRU			3	38	1	2
ACTR	1	20	15	90	3	17
ADBI			4	71	1	2
ANDE			3	67	2	12
ARLA			2	5		
ASCA			6	86		
ATFI			2	5		
BLSP			2	5		
CASC2			3	29	1	2
CLUN			8	81	2	26
COCA			14	43	10	5
COLA			15	24		
DIHO	1	20	2	43		
GAOR			3	48		
GATR			3	48		
GYDR			3	5	1	2
LIBO2	15	20	18	29	1	2
MOSI			13	10		

ASSOCIATION	ABAM-TSHE/ RHMA-GASH		ABAM/ACCI/ TITR		TSME/VAME/ XETE	
# OF PLOTS	5		21		42	
	Mean Relative Cover %	Con-stancy %	Mean Relative Cover %	Con-stancy %	Mean Relative Cover %	Constancy %
PERA			2	14	2	12
POMU	1	20	3	38		
PTAQ			3	38	3	7
PYSE			3	62	2	25
SMST			18	81	1	2
TITR			12	86		
TRLA			5	29		
TROV	1	20	2	57	2	10
VAHE			10	24		
VISE			4	43	1	19
XETE	7	60	8	10	45	88
Total Herb Cover	10	100	66	100	49	93

ASSOCIATION	TSME/ VASC		TSME/ LUZULA		TSME/ RHMA	
# OF PLOTS	36		6		22	
	Mean Relative Cover %	Con- stancy %	Mean Relative Cover %	Con- stancy %	Mean Relative Cover %	Constancy %
Mature Trees						
ABAM	14	53	33	50	12	77
ABLA2	8	19	16	33		
ABPR	14	14			13	45
CACH					3	5
PICO	11	36			5	5
PIMO	6	47			4	41
PSME	9	6			21	82
TABR					2	5
THPL					5	5
TSHE			22	17	19	41
TSME	64	100	74	100	22	95
Total Tree Cover	44	64	42	50	60	100
Regenerating Trees						
ABAM	7	28	5	83	19	82
ABLA2	4	28	2	67		
PIMO	2	50			2	9
TSHE					4	41
TSME	5	81	2	83	8	77
Shrubs						
ACCI					13	18
BENE	1	3			5	27
CACH	1	3			4	14
CHME					2	18
CHUM	3	39	1	17	3	45
GAOV					5	45
GASH					2	5
PAMY	3	3	1	17	5	23
RHMA					63	100

ASSOCIATION	TSME/ VASC		TSME/ LUZULA		TSME/ RHMA	
# OF PLOTS	36		6		22	
	Mean Relative Cover %	Con- stancy %	Mean Relative Cover %	Con- stancy %	Mean Relative Cover %	Constancy %
ROGY					2	5
RUUR	1	3			2	18
SOSI					1	9
VAAL					7	27
VAME	18	36	44	33	8	77
VAOV					1	14
VAPA					2	5
VASC	29	100	11	33	10	5
Total Cover:						
High Shrubs	32	61	5	33	73	100
Low Shrubs					8	5
Herbs						
ACTR					2	18
ANDE					2	5
ARLA			1	17		
ASCA					1	5
ATFI						
BLSP						
CLUN					2	9
COCA					3	14
LIBO2					5	27
PERA	3	11	1	33	4	14
POMU			1	17	1	5
PTAQ					1	5
PYSE	2	11			4	18
SMST					3	5
TITR					2	9
TROV					1	27
VEVI	1	3				
VISE	1	3	1	33	2	23
XETE	17	17			35	95
Total Herb Cover	19	58	28	50	38	100

APPENDIX III

Growth basal area (Hall 1971) for Willamette National Forest plant associations from intensive plot data, execpt where noted.

	Growth Basal Area (sq ft/ac)	
	Douglas-fir	Western hemlock
	Mean/n	Mean/n
Douglas-fir Series		
Douglas-fir/oceanspray-dwarf Oregon grape	311/ 5	
Douglas-fir/oceanspray/grass	312/13	
Douglas-fir/oceanspray-whipple vine	290/ 5	
Douglas-fir/snowberry	496/ 5	
Douglas-fir-western hemlock/ dwarf Oregon grape	400/ 7	
Douglas-fir-western hemlock/ rhododendron	317/ 5	
Douglas-fir-western hemlock/ salal	404/12	
Grand fir Series		
Grand fir/bearberry	213/ 3	
Grand fir/dwarf Oregon grape	370/11	
Grand fir/prince's pine[1]		
Grand fir-Pacific silver fir/ false solomonseal	496/ 3	
Western hemlock Series		
Western hemlock/Alaska huckle-berry/dogwood bunchberry	422/ 7	
Western hemlock/ dwarf Oregon grape	424/19	443/ 4

	Growth Basal Area		
	Douglas-fir	Western hemlock	Western redcedar
	Mean/n	Mean/n	Mean/n
Western hemlock/dwarf Oregon grape/Oregon oxalis	514/12	524/ 2	
Western hemlock/dwarf Oregon grape-salal	361/12	461/ 2	406/ 2
Western hemlock/dwarf Oregon grape/vanilla leaf	476/12		
Western hemlock/devil's club	413/ 7	466/ 1	
Western hemlock/Oregon oxalis	467/16	482/ 5	690/ 1
Western hemlock/rhododendron-Alaska huckleberry/dogwood bunchberry	395/ 6	519/ 1	394/ 1
Western hemlock/rhododendron/beargrass	298/ 8	336/ 2	355/ 1
Western hemlock/rhododendron-dwarf Oregon grape	367/20	343/ 7	350/ 1
Western hemlock/rhododendron/Oregon oxalis	495/ 6		
Western hemlock/rhododendron-salal	338/11	350/ 2	259/ 1
Western hemlock/rhododendron/twinflower	447/ 6		
Western hemlock/salal	334/14	385/ 1	
Western hemlock/swordfern	402/11	389/ 4	415/ 1
Western hemlock/twinflower	525/ 7		
Western hemlock/vanilla leaf	477/ 8		

[1] No data available.

[2] GBA estimated from reconnaissance plot data only.